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Environment Branch
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Saskatchewn Research Council

CLIMATOLOGICAL REFERENCE STATION
SASKATOON

ANNUAL SUMMARY
2001

C. Beaulieu
V. Wittrock

SRC Publication No. 10440-1E02

April 2002

103-06560/

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ACKNOWLEDGEMENTS

The 2001 data was compiled and recorded by Carol Beaulieu with assistance from Virginia Wittrock. Miss Beaulieu maintained the site while instrument maintenance was carried out by the Instrumentation, Certification and Testing Branch of the Saskatchewan Research Council (SRC). Elaine Wheaton and Virginia Wittrock assisted with the proofreading and editing. Consultations with Larry Flysak and Don Rybak of the Meteorological Service of Canada (MSC), Saskatoon, SK, were most helpful in verifying and comparing data. Although every caution has been taken to ensure the accuracy of data and information presented, errors may occur. If errors are noticed, we would appreciate being informed so they can be corrected.

Information and data contained in this report shall not be published, copied, placed in a retrieval system or distributed whole or in part without prior written consent of the Saskatchewan Research Council. All references made to this report shall be acknowledged.

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COVER ART
'Haying Time' Detail Oil on Artist Board
by Mavis Gray
From the collection of C.R. Beaulieu

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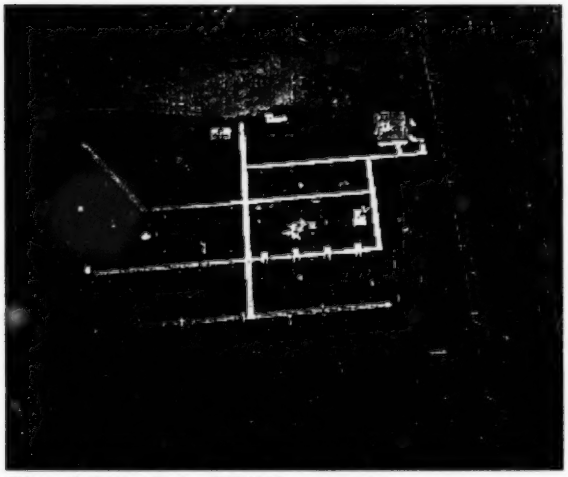
CLIMATE REFERENCE STATION HISTORY

Meteorological observations were first taken at or near Saskatoon by the Royal Northwest Mounted Police in 1889 beginning with only temperatures recorded. There is some disagreement in the early records as to the exact location of the weather observing point, but the majority of the evidence indicates 52°15'N and 106°20'W, elevation 480 m above sea level as the most probable location. This would place it at Clark's Crossing on the South Saskatchewan River, approximately 16 km northeast of the centre of the City of Saskatoon. There was a settlement at Clark's Crossing at that time as well as ten to fifteen families on either side of the river at present day Saskatoon.

Little is known about the very early observers; however, the records do show that Major T.H. Keenan took the observations from March 1892 until March 1895, and Mr. George Will was the observer from January 1897 until April 1897. It is thought that Thomas H. Copeland was involved in the observational program from 1895 to May 1, 1901, at which time it was taken over by Mr. Eby, Sr. Mr. Eby, Sr. recorded the observations until his death in 1921, at which time his daughter, Miss E.S. Eby, continued to record the observations. Her brother, Mr. J.M. Eby, recorded the observations beginning in April 1931 until the station was closed October 31, 1942. The Eby station recorded temperature, precipitation and weather notes on fog, thunderstorms, winds and any unusual weather phenomena. Reports were made twice daily, morning and evening.



Climate Reference Station, Fall 1993 (photo credit: SRC).

In 1916 a climatological station was established by the Physics Department of the University of Saskatchewan and continuous observations were kept twice daily until January 15, 1965. The longtime observer at this site was Mr. Sidney Cox. The Saskatchewan Research Council took over the program in the fall of 1963 at the newly established Climatological Reference Station at latitude 52°09'N, longitude 106°36'W and elevation 497 m asl[1]. The first observer was Terry Beck followed three years later by Orville Olm.[2] In 1967 Joe Calvert became the primary observer until his retirement in 1983. Ray Begrand succeeded Mr. Calvert until 1988 when Virginia Wittrock became the primary observer. Since 1992, the primary observer has been Carol Beaulieu assisted during the past year by Virginia Wittrock, Leanne Crone and Charlene Hudym.

In the summer of 1992, the CRS began to be converted to an automated system of data collection with the installation of a Campbell Scientific datalogger and automatic sensors. Elements presently recorded at the site are temperature, precipitation, wind, solar radiation, relative humidity, barometric pressure, soil temperatures and snow-on-the-ground (manual recordings). Temperature, precipitation and radiation data are submitted to Environment Canada.

[1] *Christiansen 1970; Environment Canada 1975*
[2] *Olm 2001*

WHAT IS THE CLIMATE REFERENCE STATION?

The Saskatchewan Research Council's Climate Reference Station (SRC CRS) at Saskatoon is classified as a principal climatological station with supplementary climatological observations[1]. A reference climatological station's data are intended for the purpose of determining climatic trends. This requires long periods (not less than thirty years) of homogeneous records, where man-made environmental changes have been or are expected to remain at a minimum. Ideally the records should be of sufficient length to enable the identification of secular changes of climate[2]. At our station, hourly readings are taken of elements which include temperature, precipitation amount, humidity, wind, and atmospheric pressure. Our supplemental observations include rate of rainfall, soil temperature, bright sunshine and solar radiation. High quality and consistent climatological observations are maintained providing data sets to meet the current concerns of the effects of climatic change and increased variability.

Purpose and Benefits

The purpose of the SRC CRS is to provide a record of the observed meteorological elements so that the climate of the area and its changes can be accurately documented and described. Climatological data have assumed new importance as a result of social and environmental issues in which climate is a dominant factor. Climatological information assists in realizing new technological opportunities and social changes. It is necessary and valuable for use in areas such as agriculture, forestry, land use and facility placement, water and energy resources, health and comfort.

The CRS also allows us to:

- evaluate long term climate trends - early warning system for increased frequencies of extreme events such as drought, floods, *etc.;*
- determine the impacts of climate events on society, economy, health, and ecosystems - *e.g.* intense rainfall causing flooding and property damage and heat stress with its implications for health;
- do value-added research;
- be part of regional, national and global networks in an important agricultural and ecological area;
- facilitate development of additional programs - *e.g.* air quality, biodiversity, and climate change monitoring;
- have roles in various programs within SRC including spray drift work, The Boreal Ecosystem - Atmosphere Study (BOREAS), and collaborative research with the Western College of Veterinary Medicine and the College of Agriculture, University of Saskatchewan, for example; and
- provide climate data to governments, universities, insurance agencies, lawyers, agricultural sectors, chemical companies, schools, building science, construction firms, media, transportation studies, accident studies, wildlife studies and interested individuals.

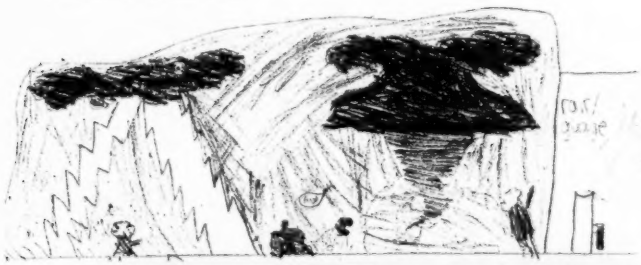
The goals of the Climate Reference Station are first, to maintain the high quality of data gathered over its more than thirty-eight years of existence at its current location and, second, to continue to monitor a large variety of elements. These various elements combined with the long-term collection period as well as the stable location allow CRS to be a very valuable climate information collection station.

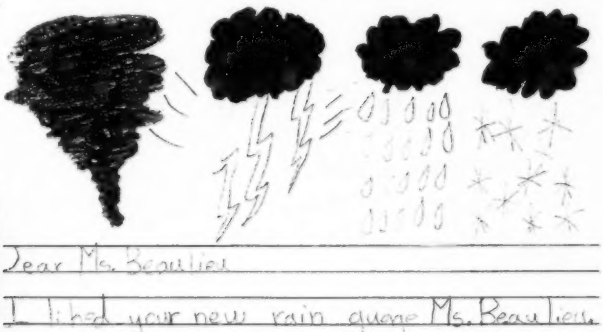
[1]*Environment Canada 1992*
[2]*World Meteorological Organization 1988*

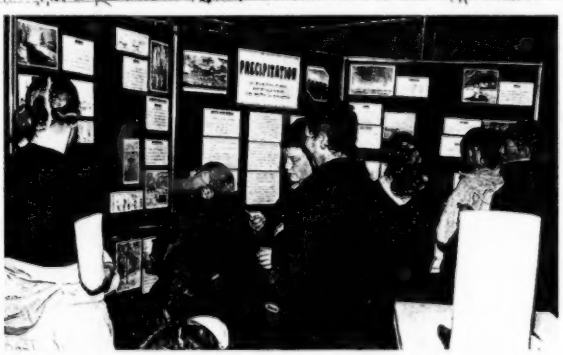
CLIMATE REFERENCE STATION OUTREACH AND PARTNERING, 2001

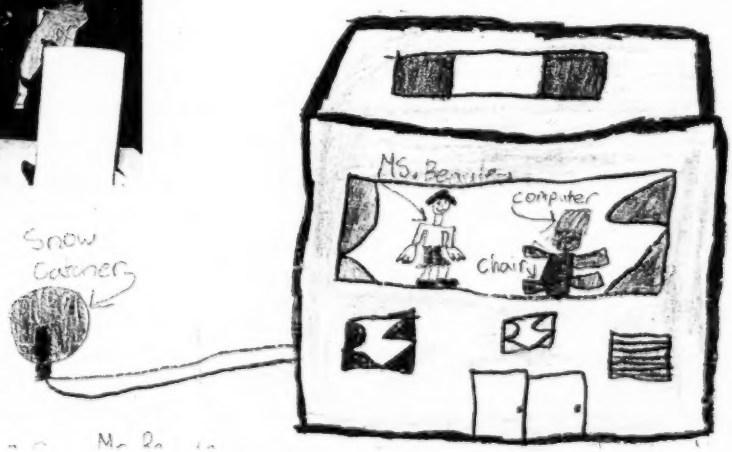
The Climate Reference Station (CRS) staff were active in outreach activities in 2001. Presentations on *'Weather Instruments and How They Work'* were conducted at the Climate Reference Station and as well as in classes. The presentations were well received by students and staff with positive post-presentation feedback. Approximately 300 children from 12 urban and rural schools, grades 2 to 4 participated in the demonstrations. Students aged 6 to 9 enjoy learning various weather terms in french during a summer tour of the site. With the help of enthusiastic volunteers, students received hands-on experience with instruments used to measure temperature, precipitation, wind and solar radiation. The climate group also participated in the two science days co-hosted by the *Saskatchewan Research Council* and *Innovators in the School.* Three hundred and sixty students during 24 presentations investigated how precipitation is measured, then and now, precipitation terminology, and what surprising things can fall from the sky.

The climate station hosted the Climate Research Branch of Meteorological Service of Canada for a precipitation gauge and thermocouple air temperature sensors field tests in 2001. The CRS compound enabled close supervision of the equipment by the scientists in a natural environment. The data from the experimental equipment was compared with the CRS data to assess possible instrument problems before being deployed in remote locations.









Art work by Ms Godson's grades 3/4 classs, Confederation Park School. Photo shows student participation in the Innovators in the School Open House.
(Photo credit: SRC)

SUMMARY FOR 2001

Data concerning temperature, precipitation, wind speed and direction, bright sunshine, solar radiation, and soil temperature, recorded at the Saskatchewan Research Council (SRC) Climatological Reference Station (CRS), (52°09'N, 106°36'W, 497 m asl) are presented for the year 2001 and compared with the long-term (*circa* 1900-2000) and standard-period (1961-1990) records.

As the old century ended in December with mean monthly temperatures ranging from 4.2°C to 3.7°C below normal, the beginning of the new millennium was very welcomed with its above normal temperatures. The monthly average minimum temperature for January was very close to the normal January average maximum temperature. February with its below normal temperatures reminded us that this was winter. It also was the coldest month and had the coldest and only temperatures of the year below -30°C; -34.3°C on the 9th and -30.1° on the 26th. The rest of the year, with the exception of October, remained near or above normal. August's monthly maximum temperature soared to 4.9°C above normal. With 12 days posting temperatures above 30°C, August was the hottest month but July received the honour of having the hottest day on the 5th at 39.3°C. This was also a new daily record. September recorded new maximum daily temperatures on the 3rd (32.2°C), 25th (33.2°C) and on the 27th (28°C). The average annual temperature for 2001 exceeded the 1961-1990 normal by 2.6°C.

The monthly growing degree-days (5°C base) were above average for the months of May to September. The year 2001 was the eighth consecutive year to have longer than average frost-free periods. The frost-free season began on May 10th (nine days earlier than average), and lasted 146 days ending on October 4th (18 days later than average). In the last decade only 1994 had a longer frost-free season with 147 days. Growing degree-days for the frost-free period were 1797.6 units; for the year there were1980.7 growing degree-day units, which is 332.2 units above normal. Cumulative heating degree-days (18°C base) remained below normal for the entire year. Cooling degree-days (18°C base) were over 100 units higher than normal due mainly to July and August hot spells.

Lack of precipitation was the great concern throughout the year. The year easily surpasses 1987, the previous driest year at the site. The Saskatoon 'A' (airport) climate station also recorded its driest year in one hundred years of records.[1] Both CRS and Saskatoon 'A' received only 46% of normal yearly precipitation[1]. By the end of December, CRS had received less than normal precipitation for 16 consecutive months. In 2001, eight months received less than 10 mm of precipitation. With the extreme temperatures in July and August, any available moisture was quickly evaporated. Highest precipitation honours were awarded to July. It was the wettest month (48.2 mm/ 86.5 % of normal); the month with the most rain-days (11days); had the wettest day (19.4 mm on 25th); and the most intense rainfall (12.2 mm in 2 hours on 25th).

The annual bright sunshine total for 2001 was 117 hours or 4.9% more than normal. April to July plus October received less than usual bright sunshine. With the exception of July, and in spite of the lack of monthly bright sunshine for late spring and early summer, the cumulative index managed to stay above the normal curve.[2]

With the exception of May, all months reported lower than average wind speeds but winds over 51 km/h for the extreme daily maximum occurred 55 times. *Near Gale* (51-62 km/h) winds occurred 45 times, *Gale* (63-75 km/h) winds eight times and *Strong Gale* (76-87 km/h) winds twice. The prevailing directions were between southwest and northwest with west-northwest predominating. May, the windiest month, experienced extreme daily maximum winds at the *Near Gale* (51-62 km/h) force for 13 days and *Gale* (63-75 km/h) force once. These winds intensified the drought conditions. The strongest wind occurred on July 28th, with winds recorded at 84.8 km/h from the west-northwest.

[1] Robinson 2002 & Environment Canada, 2002.
[2] Page 14

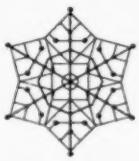
WEATHER EVENT SUMMARIES

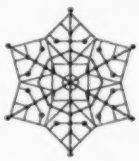
NEAR GALE WINDS (51 - 62 km/h)			
MONTH	DAY	SPEED	DIRECTION
January	04	51.6	WNW
March	26	51.2	SE
April	17	52.2	SSE
	19	53.0	WNW
	22	54.8	WSW
	24	56.3	WNW
	28	53.2	WNW
	29	51.9	W
May	01	52.4	NNE
	02	51.4	WNW
	04	53.6	SW
	05	51.6	SW
	06	56.9	NW
	07	60.6	WNW
	14	54.7	WSW
	15	62.7	WNW
	18	59.1	NW
	19	61.1	SSW
	28	58.2	SE
	30	58.6	W
	31	57.3	W
June	02	55.5	ESE
	03	51.2	ESE
	04	53.3	ESE
	09	56.3	SW
	11	53.1	WNW
	22	51.5	NW
July	05	60.0	W
	06	57.4	WSW
	11	51.4	SW
August	07	53.1	N
	08	55.6	NNW
	14	61.6	NW
	23	55.0	SW
	26	52.4	WNW
	29	52.5	NW
September	02	56.8	W
	26	52.4	SE
	28	53.8	ENE
October	03	54.3	NW
	13	53.8	SW
November	01	52.6	NW
December	01	51.5	ESE
	09	51.1	WNW
	17	58.6	WNW

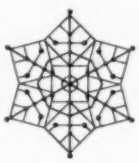
GALE WINDS (63 - 75 km/h)			
MONTH	DAY	SPEED	DIRECTION
March	19	66.3	WNW
	29	74.2	WSW
April	25	66.0	WNW
May	20	67.3	NW
	29	69.2	SSW
June	25	75.1	WSW
July	29	71.2	WSW
October	17	70.8	W

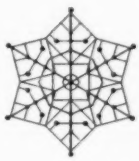
STRONG GALE WINDS (76 - 87 km/h)			
MONTH	DAY	SPEED	DIRECTION
July	28	84.8	WNW

COLD SPELL (less than or equal to -30°C)		
MONTH	DAY	TEMP
February	9	-34.3
	26	-30.1
Extreme	Feb 9	-34.3









HOT SPELL (greater than or equal to 30°C)					
MONTH	DAY	TEMP	MONTH	DAY	TEMP
April	28	31.5	August	2	32.2
May	13	31.5		3	37.8
June	21	31.7		4	35.2
	22	31.5		6	32.2
July	5	39.3		7	36.4
	7	30.8		13	33.8
	8	30.6		16	30.8
	14	33.0		18	32.2
	15	33.3		20	31.3
	17	30.8		22	34.8
	20	31.9		23	34.0
	28	34.4		27	31.5
			Sept	3	32.2
				25	33.2
Extreme	July 5	39.3	Average		33.0

YEAR	LAST SPRING FROST	FIRST FALL FROST	LENGTH OF SEASON (days)
1993	May 17	Sept 14	119
1994	May 9	Oct 04	147
1995	May 22	Sept 19	119
1996	May 12	Sept 29	139
1997	May 14	Oct 05	143
1998	May 13	Sept 30	138
1999	May 9	Sept 27	140
2000	May 17	Sept 23	128
2001	May10	Oct 04	146
1961-1990 Normal	May 19	Sept 15	118

WETTEST DAYS (mm)		
MONTH	DAY	AMOUNT
May	19	14.2
July	25	19.4

WETTEST MONTH mm	
July	48.2

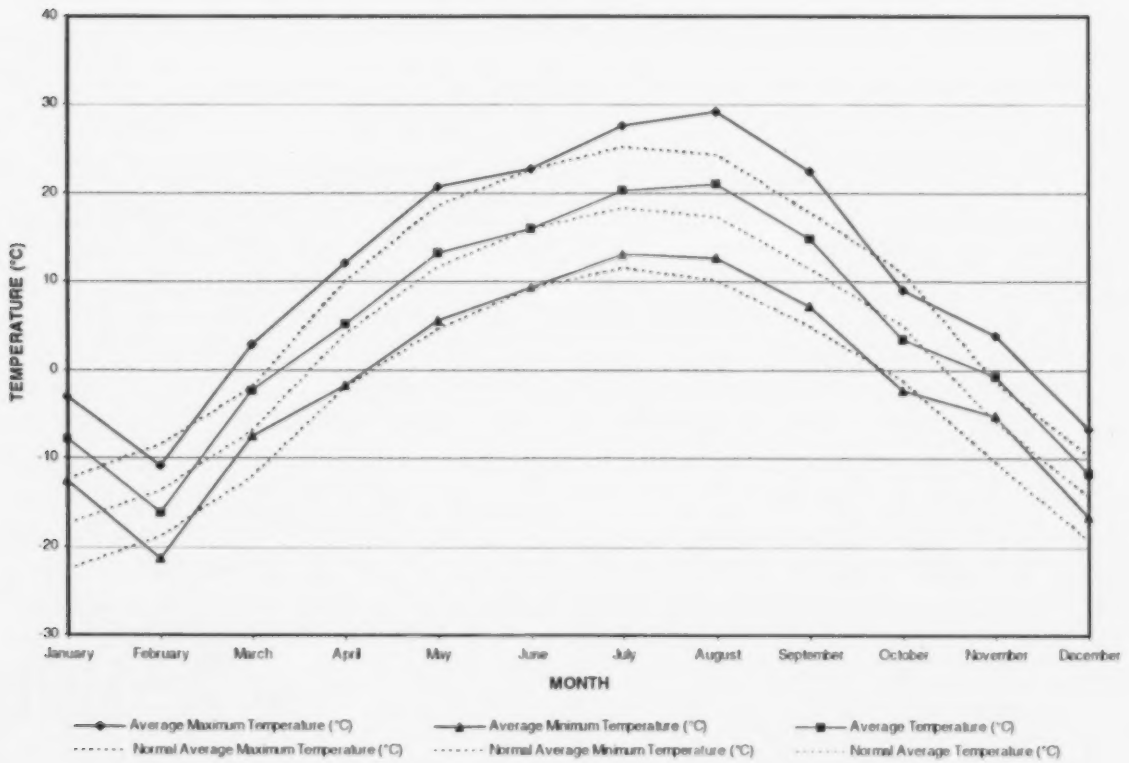
DRIEST MONTH mm	
January	2.6

GREATEST RAINFALL (mm)			
MONTH	DAY	AMOUNT	PERIOD
July	25	6.0	.5 hour
Sept	19	5.6	.5 hour
May	19	7.6	1 hour
July	25	10.6	1 hour
May	19	11.0	2 hours
July	25	12.2	2 hours

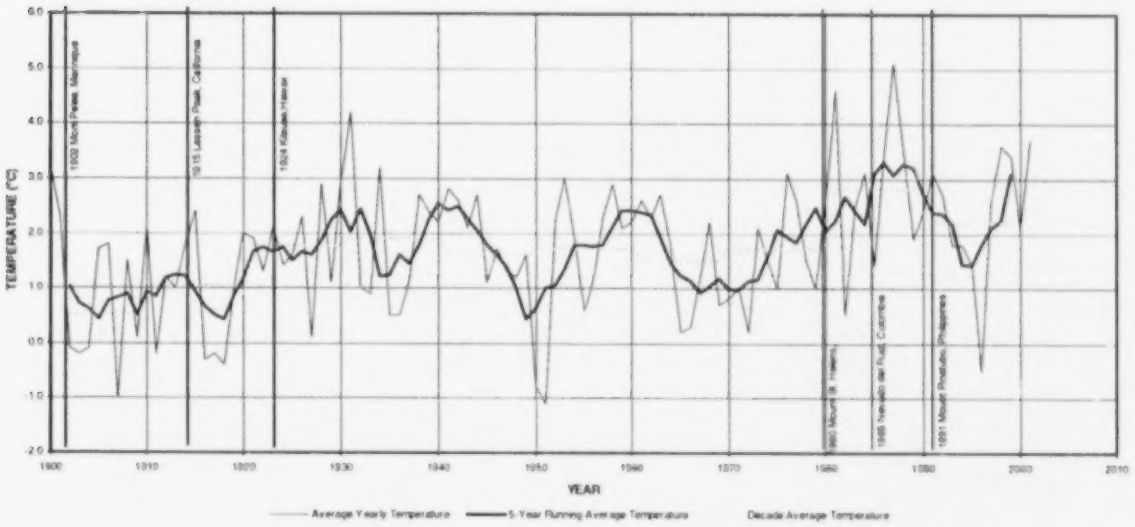
Monthly Average Temperatures, 2001

MONTH	AVERAGE MAXIMUM TEMPERATURE (°C)		AVERAGE MINIMUM TEMPERATURE (°C)		AVERAGE TEMPERATURE (°C)		EXTREME VALUES FOR TEMPERATURE (°C)	
	2001	Normal	2001	Normal	2001	Normal	Maximum/Date	Minimum/Date
January	-3.0	-12.4	-12.5	-22.6	-7.8	-17.4	4.6/04	-24.0/31
February	-10.9	-8.6	-21.4	-18.9	-16.2	-13.7	3.0/03	-34.3/09
March	2.9	-2.1	-7.5	-12.1	-2.3	-7.0	13.5/19	-19.4/23
April	12.1	9.9	-1.7	-2.0	5.2	4.0	31.5/28	-13.2/15
May	20.7	18.5	5.6	4.5	13.2	11.6	31.5/13	-1.9/03
June	22.7	22.6	9.3	9.2	16.0	15.9	31.7/21	3.8/13
July	27.6	25.1	13.0	11.5	20.3	18.3	39.3/05	6.7/04
August	29.2	24.3	12.7	10.1	21.0	17.2	37.8/03	5.9/12
September	22.4	17.7	7.1	4.9	14.8	11.3	33.2/25	0.5/12
October	9.1	10.9	-2.3	-1.3	3.4	4.8	19.6/01	-12.0/25
November	3.9	-1.5	-5.2	-10.6	-0.7	-6.0	16.3/04	-14.2/26
December	-6.7	-9.8	-16.6	-19.3	-11.7	-14.5	6.3/17	-24.0/06
Average	10.8	7.9	-1.6	-3.9	4.6	2.0		

Normal = 1961-1990 average

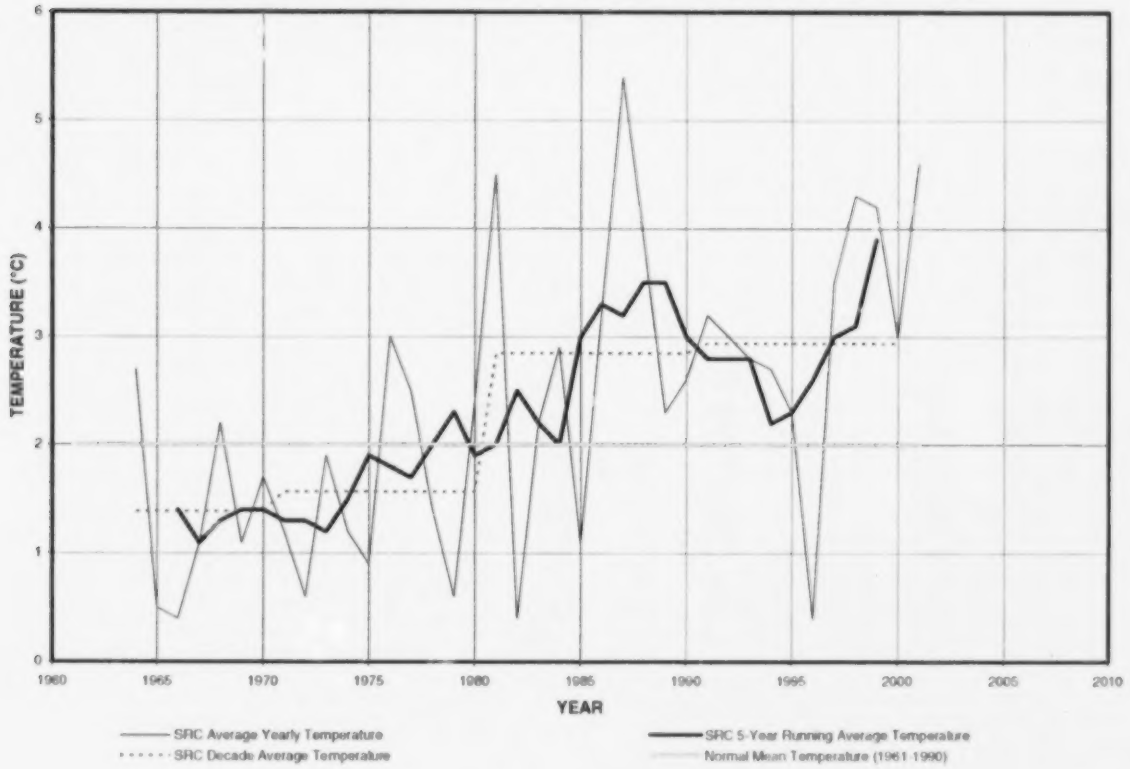


Average Annual Temperature Time Series for Saskatoon 'A', 1900 - 2001[1,2]



[1] *Environment Canada, Meterological Services of Canada 2000*
[2] *U.S. Geological Survey Cascades Volcano Observatory, web site*

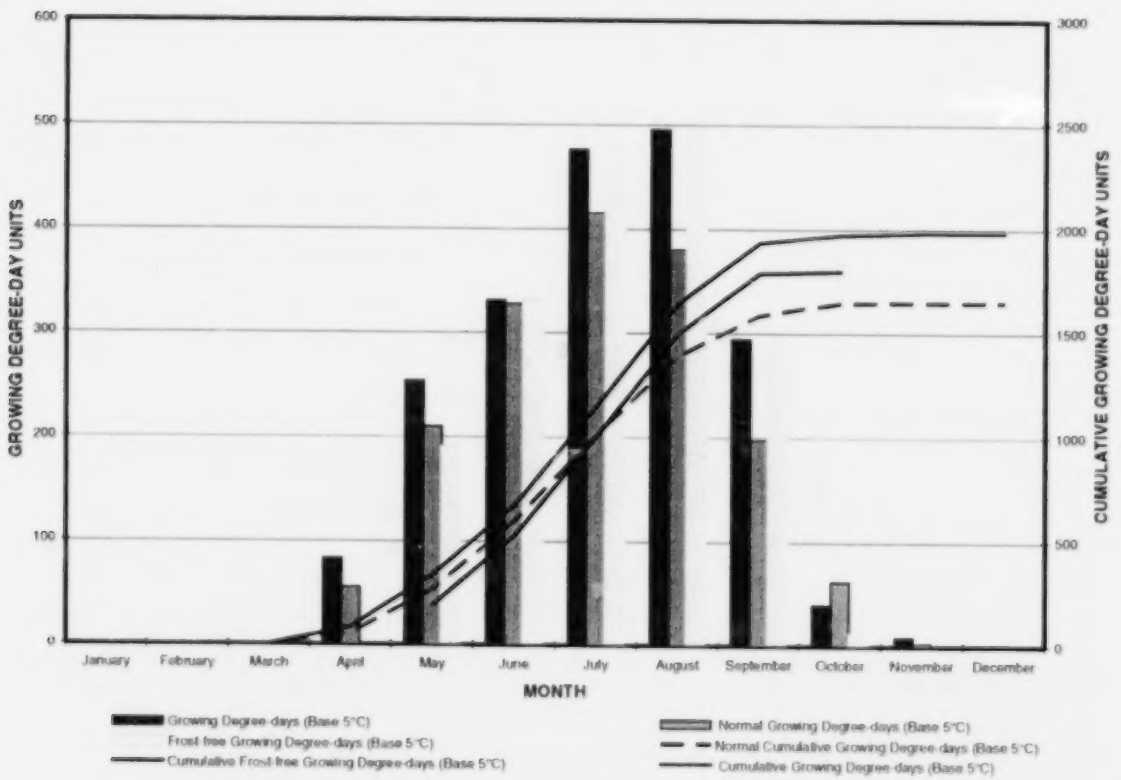
Average Annual Temperature Time Series for CRS, 1964 - 2001



Monthly Growing Degree-Days, 2001

MONTH	GROWING DEGREE-DAYS Base 5°C		CUMULATIVE GROWING DEGREE-DAYS Base 5°C		FROST-FREE GROWING DEGREE-DAYS Base 5°C	
	2001	Normal	2001	Normal	2001	Cumulative
January	0.0	0.0	0.0	0.0		
February	0.0	0.0	0.0	0.0		
March	0.6	1.2	0.6	1.2		
April	82.8	54.8	83.4	56.0		
May	253.2	209.4	336.6	265.4	189.8	189.8
June	330.9	327.3	667.5	592.7	330.9	520.7
July	475.7	414.8	1143.2	1007.5	475.7	996.4
August	495.1	379.6	1638.3	1387.1	495.1	1491.5
September	294.0	197.1	1932.3	1584.2	294.0	1785.5
October	39.7	61.5	1972.0	1645.7	12.1	1797.6
November	8.7	2.7	1980.7	1648.4		
December	0.0	0.0	1980.7	1648.4		
Total	1980.7	1648.4			1797.6	

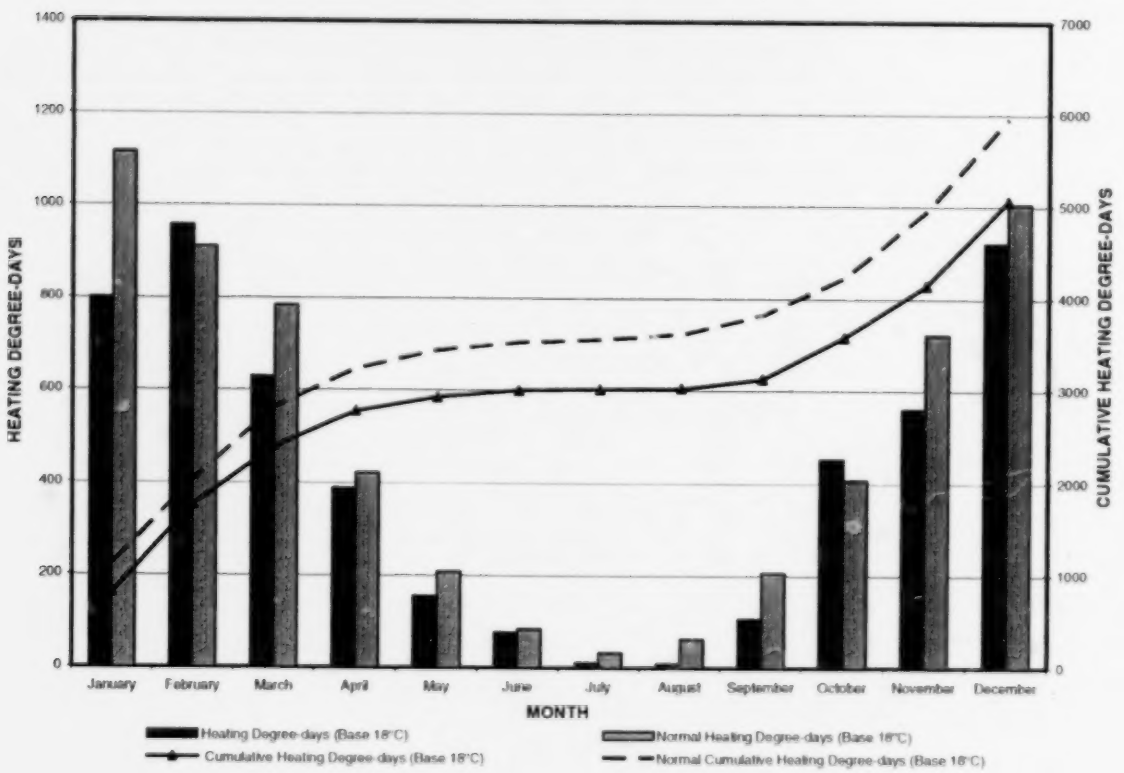
Normal = 1961-1990 average



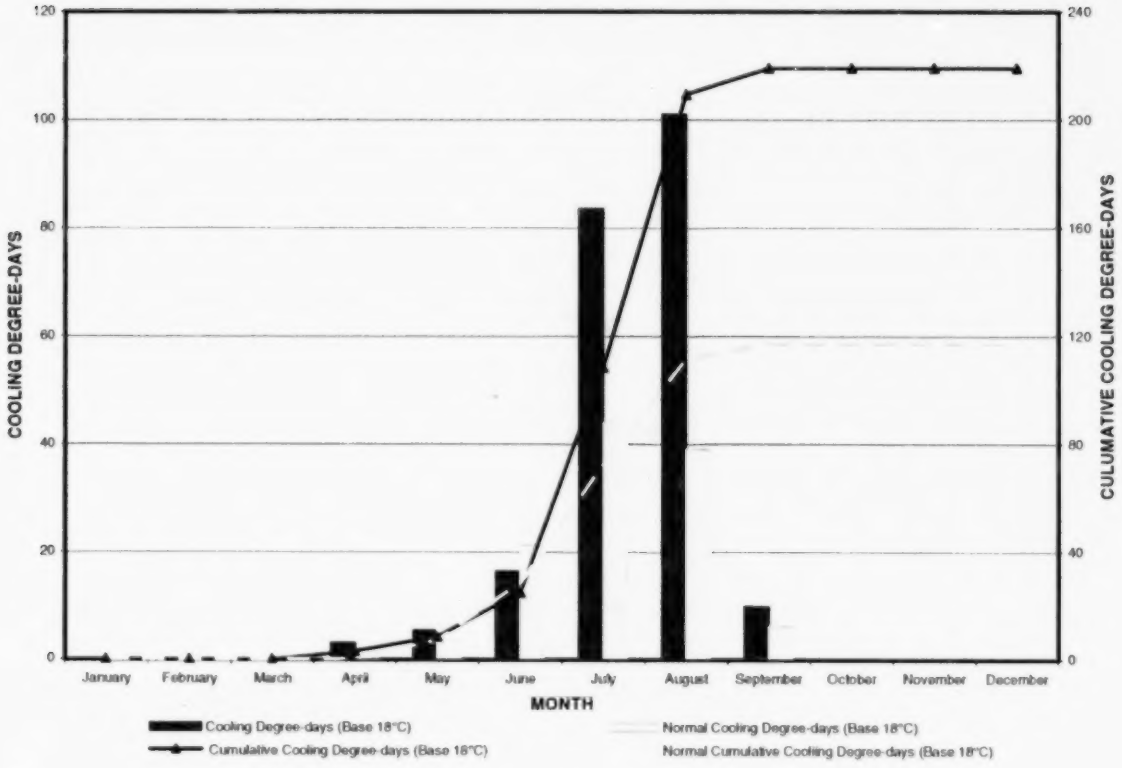
Monthly Heating and Cooling Degree-Days, 2001

MONTH	HEATING DEGREE-DAYS Base 18°C		CUMULATIVE HEATING DEGREE-DAYS Base 18°C		COOLING DEGREE-DAYS Base 18°C		CUMULATIVE COOLING DEGREE-DAYS Base 18°C	
	2001	Normal	2001	Normal	2001	Normal	2001	Normal
January	799.4	1114.8	799.4	1114.8	0.0	0.0	0.0	0.0
February	956.6	909.9	1756.0	2024.7	0.0	0.0	0.0	0.0
March	629.4	784.1	2385.4	2808.8	0.0	0.0	0.0	0.0
April	387.4	420.9	2772.8	3229.7	3.1	0.2	3.1	0.2
May	155.2	206.9	2928.0	3436.6	5.4	7.0	8.5	7.2
June	75.5	84.0	3003.5	3520.6	16.4	21.2	24.9	28.4
July	10.8	32.0	3014.3	3552.6	83.5	43.9	108.4	72.3
August	8.9	62.4	3023.2	3615.0	101.0	39.0	209.4	111.3
September	105.8	206.2	3129.0	3821.2	9.8	6.2	219.2	117.5
October	451.9	406.5	3580.9	4227.7	0.0	0.0	219.2	117.5
November	560.6	721.5	4141.5	4949.2	0.0	0.0	219.2	117.5
December	921.1	1004.8	5062.6	5954.0	0.0	0.0	219.2	117.5
Total	5062.6	5954.0	35596.6	5954.0	219.2	117.5	1231.1	117.5

Normal = 1961-1990 average



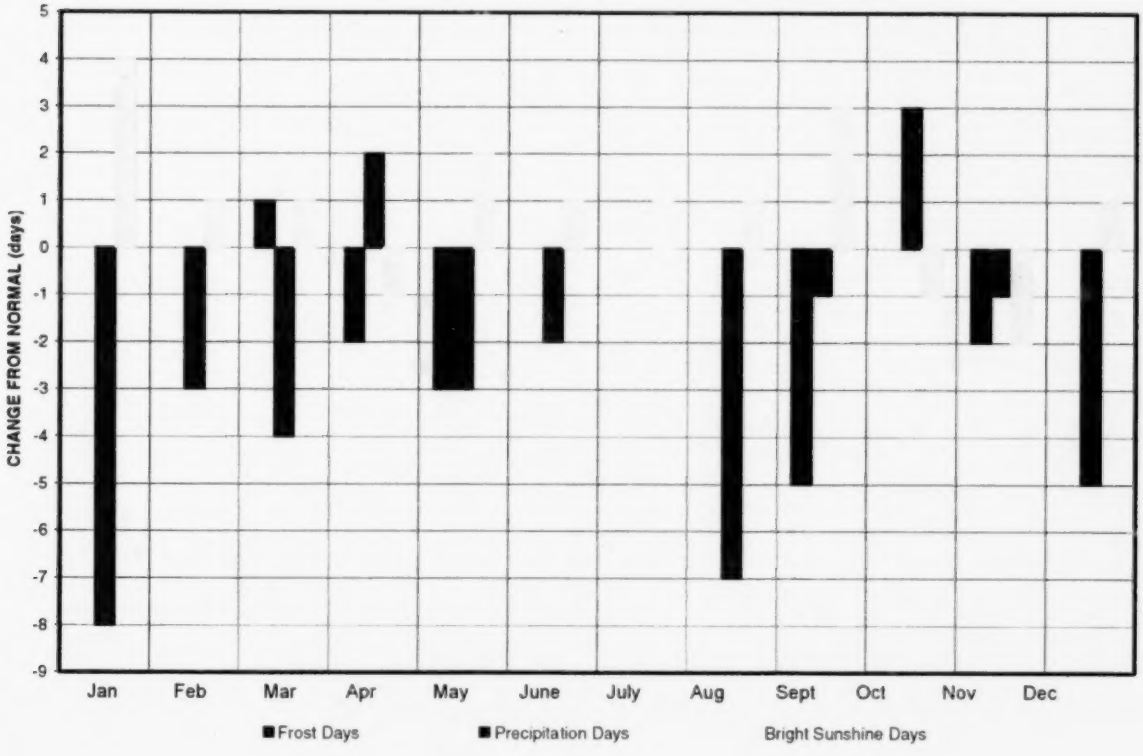
Monthly Cooling Degree-Days Graph, 2001



Number of Days with Frost, Precipitation & Bright Sunshine, 2001

MONTH	FROST DAYS		PRECIPITATION DAYS		BRIGHT SUNSHINE DAYS	
	2001	Normal	2001	Normal	2001	Normal
January	31	31	3	11	28	24
February	28	28	7	10	26	25
March	31	30	5	9	28	27
April	18	20	9	7	26	27
May	3	6	6	9	31	29
June	0	0	10	12	30	29
July	0	0	11	11	31	30
August	0	0	2	9	31	30
September	0	5	8	9	30	27
October	20	20	9	6	26	27
November	27	29	7	8	20	22
December	31	31	7	12	24	23
Total	189	200	84	113	331	320

Normal = 1961-1990 average

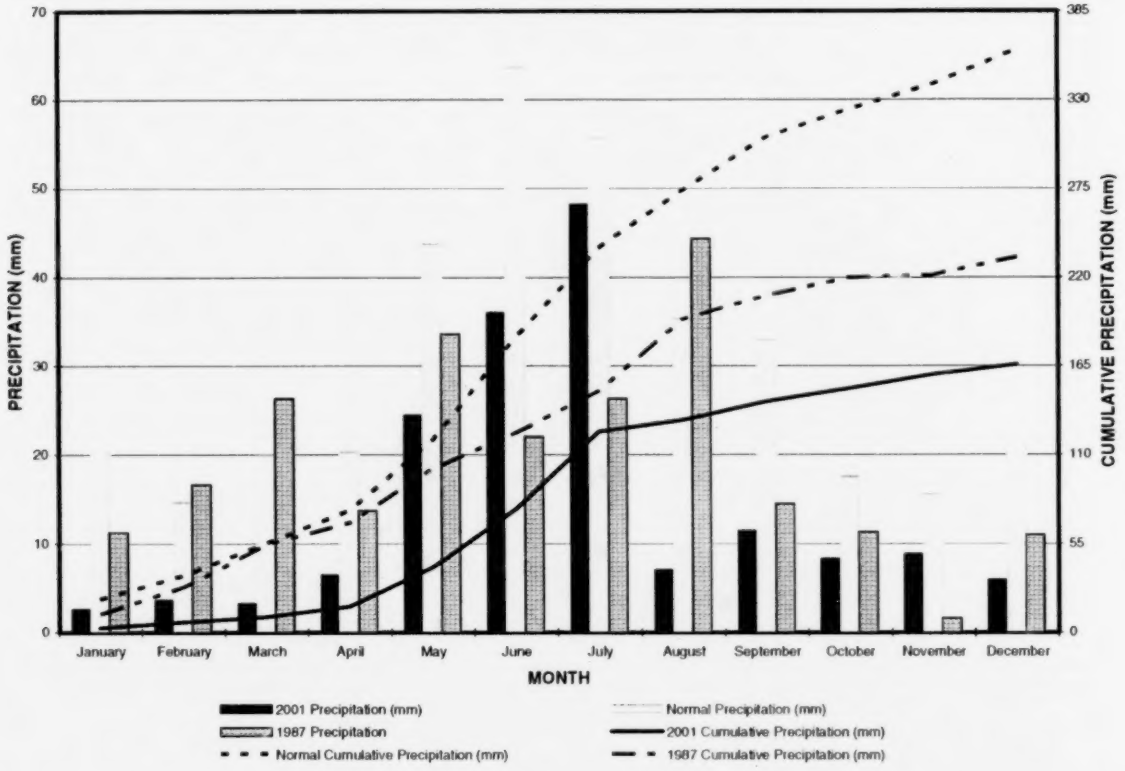


Monthly Precipitation, 2001

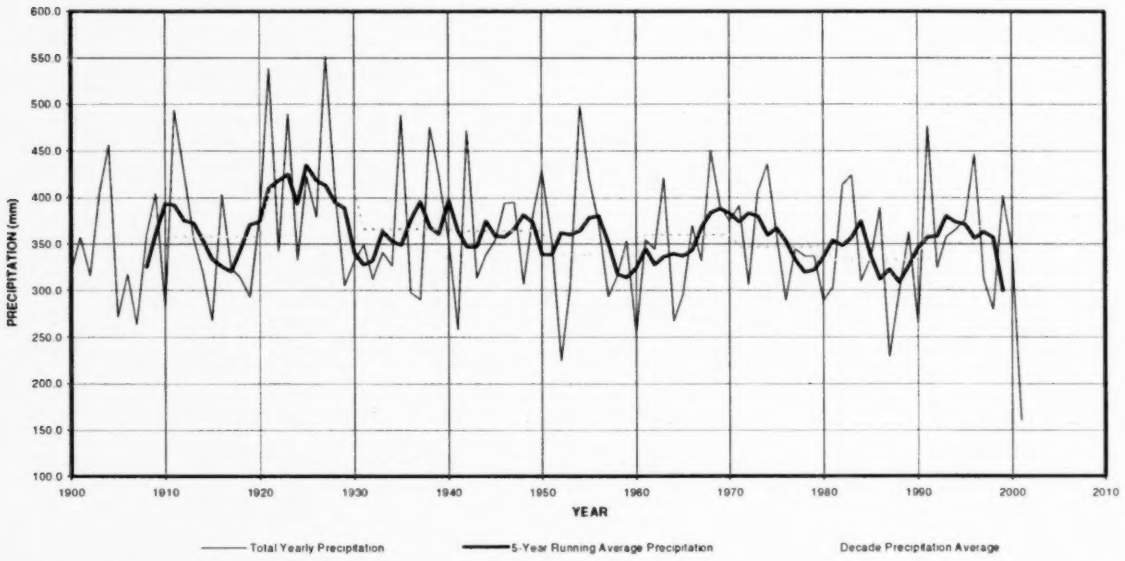
MONTH	PRECIPITATION (mm)				CUMULATIVE PRECIPITATION (mm)				EXTREME VALUE (mm)
	2001	Normal	%	1987	2001	Normal	%	1987	Value/Date
January	2.6	20.5	12.7	11.2	2.6	20.5	12.7	11.2	1.5/31
February	3.6	14.6	24.7	16.6	6.2	35.1	17.7	27.8	1.2/14
March	3.2	19.9	16.1	26.3	9.4	55.0	17.1	54.1	1.4/22
April	6.4	20.3	31.5	13.7	15.8	75.3	21.0	67.8	2.0/07
May	24.4	43.7	55.8	33.6	40.2	119.0	33.8	101.4	14.2/19
June	36.0	63.6	56.6	22.0	76.2	182.6	41.7	123.4	9.0/09
July	48.2	55.7	86.5	26.3	124.4	238.3	52.2	149.7	19.4/25
August	7.0	35.3	19.8	44.3	131.4	273.6	48.0	194.0	6.0/14
September	11.4	32.9	34.7	14.5	142.8	306.5	46.6	208.5	6.4/19
October	8.3	17.5	47.4	11.3	151.1	324.0	46.6	219.8	4.5/22
November	8.8	15.5	56.8	1.6	159.9	339.5	47.1	221.4	3.4/08
December	5.9	21.3	27.7	11.0	165.8	360.8	46.0	232.4	3.4/03
Total	165.8	360.8	46.0	232.4					

1987 = previous driest year since 1964

Normal = 1961-1990 average

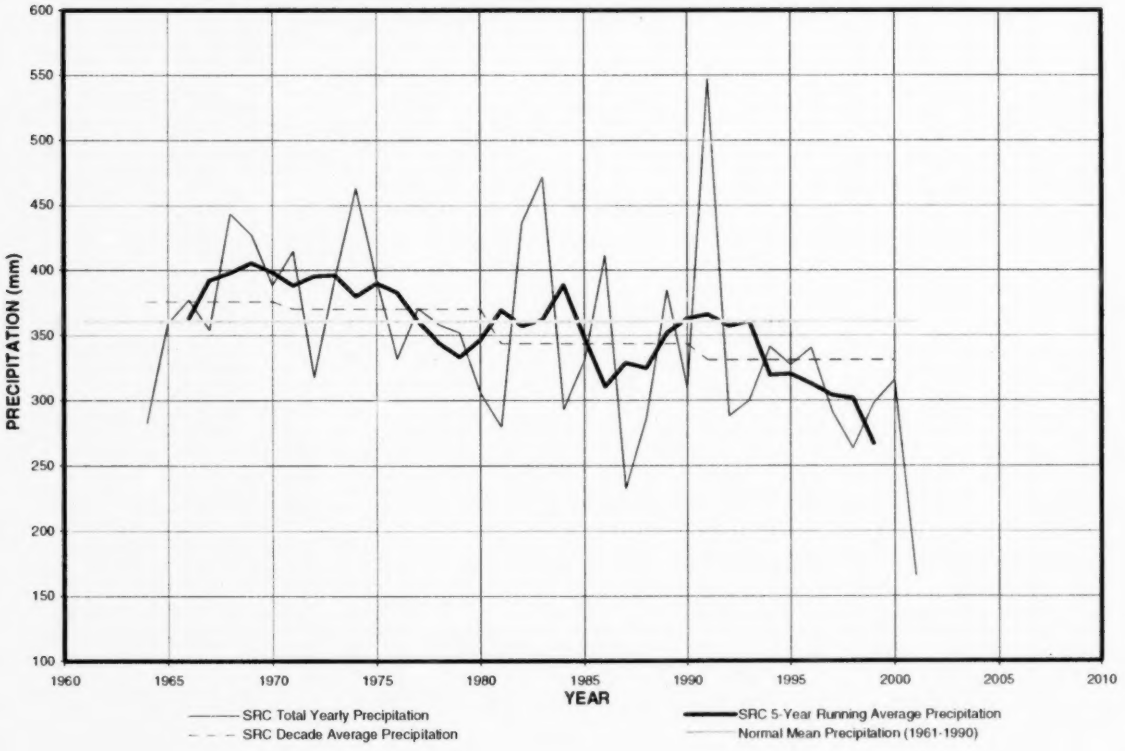


Total Annual Precipitation Time Series for Saskatoon 'A', 1900 - 2001[1,2]



[1] *Environment Canada, Meterological Service of Canada 2000*
[2] *U.S. Geological Survey Cascades Volcano Observatory, web site*

Total Annual Precipitation Time Series for CRS, 1964 - 2001



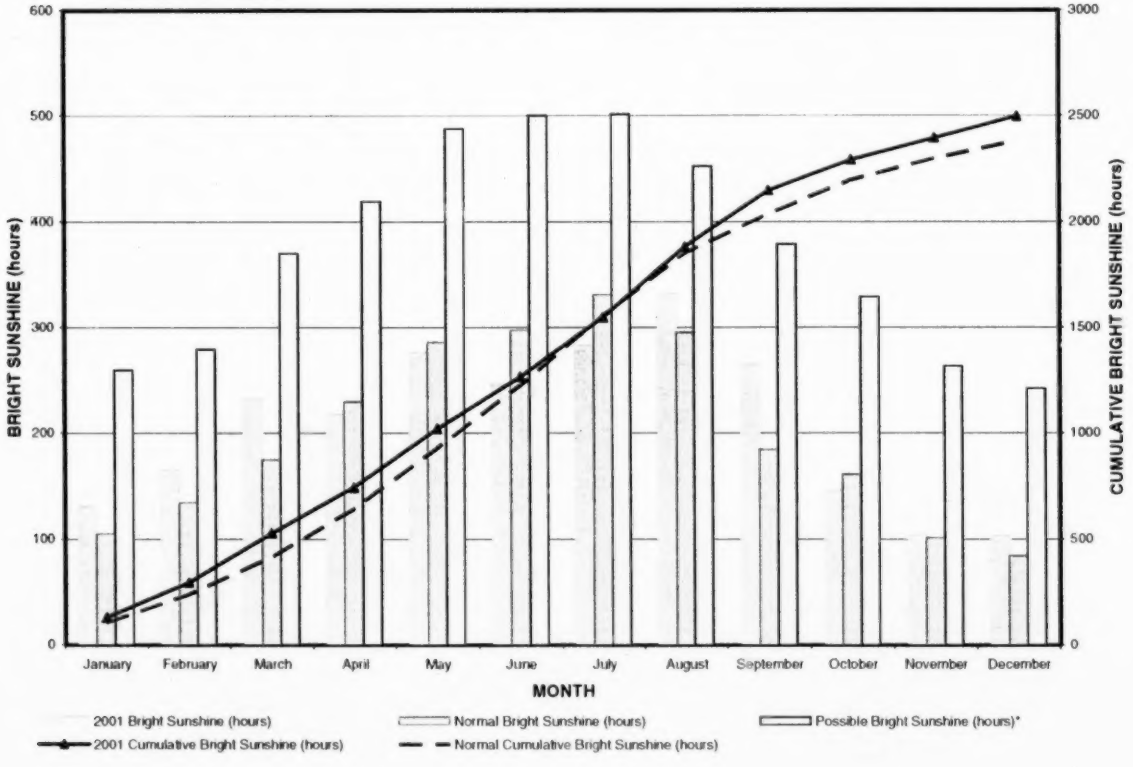
Monthly Bright Sunshine, 2001

MONTH	BRIGHT SUNSHINE (hours)				CUMULATIVE BRIGHT SUNSHINE (hours)	
	2001	Normal	Possible*	% of Possible	2001	Normal
January	130.0	104.6	259.5	50.1	130.0	104.6
February	164.6	134.1	279.3	58.9	294.6	238.7
March	232.0	174.6	369.8	62.7	526.6	413.3
April	217.5	229.4	418.9	51.9	744.1	642.7
May	276.4	285.7	487.9	56.7	1020.5	928.4
June	245.9	297.2	500.2	49.2	1266.4	1225.6
July	282.5	330.3	501.6	56.3	1548.9	1555.9
August	332.4	295.2	452.1	73.5	1881.3	1851.1
September	265.3	184.4	378.8	70.0	2146.6	2035.5
October**	145.3	160.7	328.8	44.2	2291.9	2196.2
November	103.6	100.9	263.7	39.3	2395.5	2297.1
December	102.3	83.7	242.0	42.3	2497.8	2380.8
Total	2497.8	2380.8	4482.6	55.7		

* Possible Bright Sunshine hours calculated from National Research Council of Canada, Hertzberg Institute of Astrophysics sunrise/sunset table for 2001

**Power outages from October 4 to 10 & 26 to 30. Data from University of Saskatchewan, Kernen Farm station

Normal = 1961-1990 average



Sunrise[1] and Sunset[1] at Saskatoon, 2001 and 2002[2]

(local time in hours and minutes)

2001	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
Date	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
1	9:15	17:06	8:46	17:55	7:52	18:47	6:41	19:41	5:36	20:32	4:52	21:18	4:50	21:30	5:28	20:56	6:18	19:53	7:08	18:43	8:02	17:37	8:53	16:58
2	9:15	17:07	8:45	17:57	7:50	18:49	6:38	19:43	5:34	20:34	4:51	21:19	4:51	21:30	5:30	20:55	6:20	19:51	7:10	18:41	8:04	17:36	8:55	16:57
3	9:15	17:08	8:43	17:58	7:47	18:50	6:36	19:45	5:32	20:36	4:50	21:20	4:52	21:29	5:31	20:53	6:22	19:49	7:11	18:39	8:05	17:34	8:56	16:57
4	9:15	17:09	8:41	18:00	7:45	18:52	6:34	19:46	5:30	20:37	4:49	21:21	4:53	21:29	5:33	20:51	6:23	19:46	7:13	18:38	8:08	17:32	8:57	16:56
5	9:14	17:10	8:40	18:02	7:43	18:54	6:31	19:48	5:28	20:39	4:49	21:22	4:54	21:28	5:34	20:49	6:25	19:44	7:15	18:34	8:10	17:30	8:59	16:56
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7	9:13	17:13	8:36	18:06	7:38	18:58	6:27	19:51	5:25	20:42	4:48	21:24	4:55	21:27	5:38	20:46	6:28	19:40	7:18	18:30	8:13	17:27	9:01	16:55
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31	8:48	17:53			6:43	19:39			4:52	21:17			5:27	20:58	6:17	19:56			8:00	17:39			9:15	17:04

[1]Sunrise/set = corresponds to the upper limb of the sun appearing at the horizon [2]National Research Council of Canada, Hertzberg Institute of Astrophysics

2002	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
Date	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
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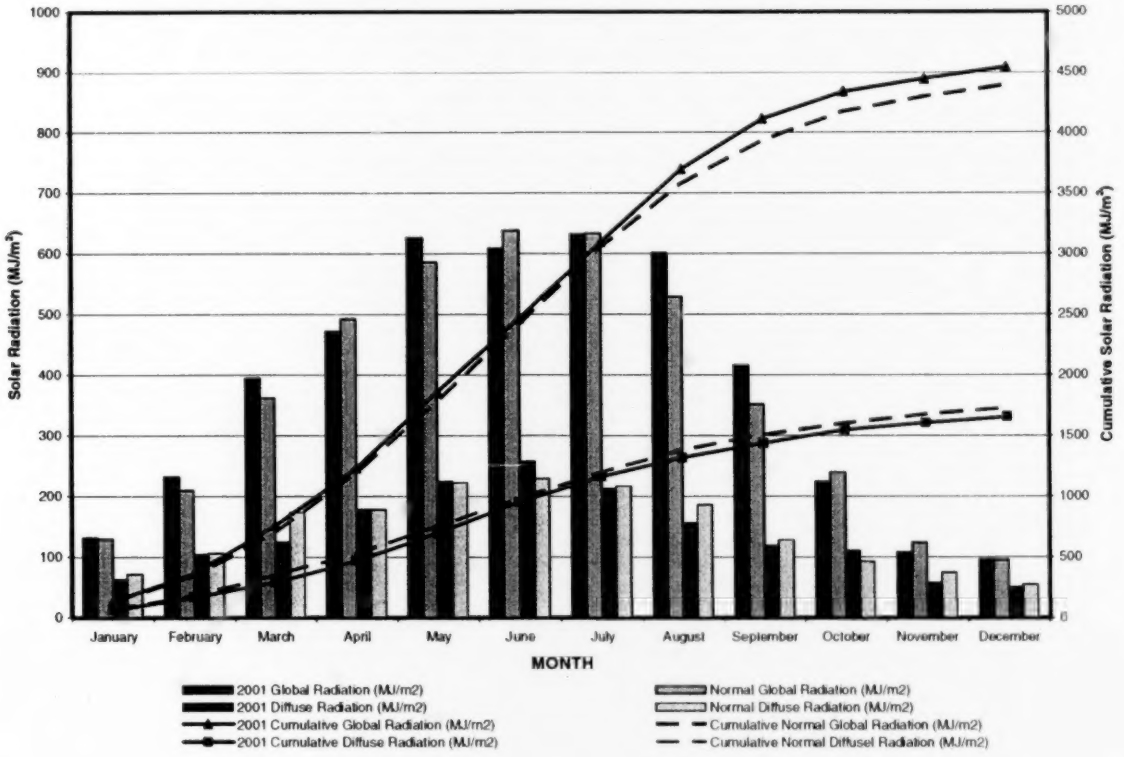
18	9:05	17:29	8:16	18:26	7:14	19:16	6:03	20:10	5:08	20:59	4:45	21:30	5:08	21:17	5:55	20:25	6:46	19:14	7:37	18:06	8:32	17:11	9:11	16:55
19	9:04	17:31	8:14	18:28	7:11	19:18	6:01	20:12	5:06	21:01	4:45	21:31	5:09	21:16	5:57	20:22	6:47	19:12	7:39	18:04	8:34	17:10	9:12	16:55
20	9:03	17:33	8:12	18:30	7:09	19:20	5:59	20:13	5:05	21:02	4:45	21:31	5:10	21:15	5:58	20:20	6:49	19:10	7:41	18:02	8:36	17:08	9:13	16:56
21	9:02	17:34	8:09	18:32	7:07	19:22	5:57	20:15	5:04	21:04	4:46	21:31	5:12	21:13	6:00	20:18	6:51	19:07	7:42	18:00	8:37	17:07	9:13	16:56
22	9:00	17:36	8:07	18:33	7:04	19:23	5:54	20:17	5:02	21:05	4:46	21:31	5:13	21:12	6:02	20:16	6:52	19:05	7:44	17:57	8:39	17:06	9:14	16:57
23	9:00	17:38	8:05	18:35	7:02	19:25	5:52	20:18	5:01	21:06	4:46	21:31	5:14	21:10	6:03	20:14	6:54	19:03	7:46	17:55	8:41	17:05	9:14	16:57
24	8:58	17:40	8:03	18:37	7:00	19:27	5:50	20:20	5:00	21:08	4:46	21:31	5:16	21:09	6:05	20:12	6:56	19:00	7:47	17:53	8:42	17:04	9:14	16:58
25	8:57	17:41	8:01	18:39	6:57	19:29	5:48	20:22	4:59	21:09	4:47	21:31	5:1700 /	21:08	6:07	20:10	6:57	18:58	7:49	17:51	8:44	17:03	9:15	16:59
26	8:56	17:43	7:59	18:41	6:55	19:30	5:46	20:24	4:58	21:10	4:47	21:31	5:19	21:06	6:08	20:07	6:59	18:56	7:51	17:49	8:45	17:02	9:15	16:59
27	8:54	17:45	7:57	18:43	6:53	19:32	5:44	20:25	4:56	21:12	4:48	21:31	5:20	21:05	6:10	20:05	7:01	18:53	7:53	17:47	8:47	17:01	9:15	17:00
28	8:53	17:47	7:54	18:45	6:50	19:34	5:42	20:27	4:55	21:13	4:48	21:31	5:22	21:03	6:11	20:03	7:02	18:51	7:55	17:45	8:49	17:00	9:15	17:01
29	8:51	17:49			6:48	19:36	5:40	20:29	4:54	21:14	4:49	21:31	5:23	21:02	6:13	20:01	7:04	18:49	7:56	17:43	8:50	17:00	9:15	17:02
30	8:50	17:50			6:46	19:37	5:38	20:30	4:54	21:15	4:50	21:31	5:25	21:00	6:15	19:58	7:06	18:46	7:58	17:42	8:51	16:59	9:15	17:03
31	8:48	17:52			6:43	19:39			4:53	21:17			5:26	20:59	6:16	19:56			8:00	17:40			9:15	17:04

[1]Sunrise/set = corresponds to the upper limb of the sun appearing at the horizon [2]National Research Council of Canada, Hertzberg Institute of Astrophysics

Monthly Global and Diffuse Solar Radiation, 2001

MONTH	GLOBAL RADIATION (MJ/m^2)		CUMULATIVE GLOBAL RADIATION (MJ/m^2)		DIFFUSE RADIATION (MJ/m^2)		CUMULATIVE DIFFUSE RADIATION (MJ/m^2)	
	2001	Normal	2001	Normal	2001	Normal	2001	Normal
January	131.3	129.9	131.3	129.9	62.6	71.4	62.6	71.4
February	231.2	210.1	362.5	340.0	103.3	105.3	165.9	176.7
March	394.6	362.4	757.1	702.4	124.4	173.9	290.3	350.6
April	471.7	492.2	1228.8	1194.6	178.5	178.5	468.8	529.1
May	626.4	586.3	1855.2	1780.9	224.0	222.2	692.8	751.3
June	609.3	638.7	2464.5	2419.6	256.9	228.1	949.7	979.4
July	631.7	633.5	3096.2	3053.1	212.5	216.5	1162.2	1195.9
August	601.8	529.0	3698.0	3582.1	155.7	185.6	1317.9	1381.5
September	415.1	351.8	4113.1	3933.9	118.8	127.6	1436.7	1509.1
October	223.5	239.1	4336.6	4173.0	110.4	92.6	1547.1	1601.7
November	107.7	123.7	4444.3	4296.7	57.4	73.6	1604.5	1675.3
December	96.3	95.2	4540.6	4391.9	50.1	54.3	1654.6	1729.6
Total	4540.6	4391.9			1654.6	1729.6		

Normal = 1961-1990 average



Daily Global and Diffuse Solar Radiation (MJ/m²), 2001

DATE	JAN		FEB		MAR		APR		MAY		JUN		JULY		AUG		SEPT		OCT		NOV		DEC	
	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D
1	5.1	1.9	3.4	3.5	12.3	1.8	17.1	4.0	18.3	6.9	24.6	7.4	7.3	6.5	23.4	4.2	17.7	3.7	9.3	4.6	2.9	3.0	3.5	1.5
2	4.1	1.5	5.4	3.8	8.6	6.0	17.1	7.0	14.2	6.9	25.3	8.1	25.3	7.2	23.8	3.9	19.3	3.8	9.1	5.4	7.3	1.6	2.5	1.6
3	3.0	2.5	6.2	1.7	5.6	5.8	6.9	6.9	23.6	5.0	18.8	12.3	26.8	5.7	24.1	2.7	14.4	8.1	11.3	2.3	6.7	1.6	1.3	1.5
4	3.8	1.0	6.8	1.6	5.3	5.4	3.6	3.5	21.1	8.0	27.5	8.5	27.9	3.0	22.2	3.9	17.5	3.8	9.0	6.1	4.8	3.6	5.8	1.2
5	2.4	1.9	4.8	4.0	6.3	6.2	17.9	5.3	15.7	8.6	23.5	9.3	16.2	12.3	22.9	4.6	12.7	6.8	11.8	3.2	5.6	2.8	2.8	2.4
6	1.5	1.5	6.7	1.7	10.5	4.6	12.5	8.9	13.3	10.1	9.6	7.7	28.1	3.3	24.1	2.6	17.2	2.7	11.8	1.8	5.0	2.8	5.2	1.5
7	4.9	1.4	5.3	3.6	12.8	2.7	7.6	6.3	24.6	6.3	23.6	8.2	27.0	3.4	23.4	2.7	11.8	6.4	10.2	3.7	1.7	1.7	4.7	1.3
8	5.0	1.2	6.8	4.6	12.8	1.9	19.0	4.4	20.8	9.0	25.5	6.2	24.3	5.7	13.2	8.5	12.8	6.6	10.5	3.6	3.2	3.2	3.0	1.4
9	3.6	1.6	10.1	2.6	6.6	6.3	8.0	7.6	23.4	5.6	17.5	8.0	27.2	3.3	22.2	7.6	16.1	3.4	9.8	3.2	6.1	1.3	1.9	1.9
10	5.1	1.2	9.7	2.9	13.5	3.0	6.8	6.3	23.4	6.2	21.1	11.2	20.8	10.1	21.2	6.0	13.2	7.5	10.7	1.8	4.8	1.7	3.0	2.4
11	3.1	2.3	10.4	2.8	6.8	5.9	6.3	6.3	22.8	8.3	25.9	6.3	18.3	11.2	19.5	7.6	11.7	4.4	8.4	4.4	5.9	1.4	1.8	1.8
12	3.2	2.2	5.6	4.7	11.4	4.3	5.9	5.5	23.1	6.4	12.3	10.5	11.7	9.6	23.0	2.5	16.8	2.8	8.8	4.1	5.8	1.4	2.1	2.2
13	2.2	1.9	7.9	5.0	12.4	4.0	14.7	6.7	15.0	8.6	17.1	12.2	20.6	10.0	21.6	4.4	7.1	6.4	2.9	2.9	5.0	1.9	3.8	1.2
14	3.2	2.3	4.1	4.3	13.4	4.1	9.7	8.4	19.8	8.4	19.6	9.0	23.0	6.8	18.0	7.0	16.2	2.1	5.1	4.3	3.3	2.6	2.4	1.8
15	1.7	1.7	8.7	2.4	14.7	3.9	22.5	2.5	21.2	8.8	16.8	9.8	23.2	5.4	22.6	3.2	16.3	2.8	9.7	2.3	4.4	2.0	3.1	1.1
16	3.7	3.1	6.5	6.1	15.3	2.0	21.5	4.3	26.0	4.4	22.4	9.6	10.7	7.4	20.5	4.2	15.9	3.5	6.7	3.9	3.8	2.0	2.8	1.8
17	3.4	2.1	10.6	2.4	12.6	5.3	17.7	8.0	22.7	7.3	11.3	8.2	24.7	5.6	21.9	2.6	15.6	4.3	7.0	3.7	1.3	1.4	2.5	1.9
18	2.0	2.0	10.6	2.2	15.4	2.1	20.8	3.5	21.1	8.4	22.4	8.8	17.3	4.3	21.1	4.0	14.5	3.2	5.1	4.6	5.2	1.0	3.4	0.8
19	4.4	2.3	10.4	3.0	12.4	3.0	13.4	7.9	10.9	9.0	21.7	9.3	20.6	6.0	12.9	7.2	12.3	5.4	5.0	3.9	3.6	2.1	3.2	2.0
20	5.6	1.9	11.6	2.2	15.7	2.4	13.6	8.9	14.5	8.9	28.2	4.1	24.0	6.5	19.4	5.1	10.2	4.5	2.6	2.6	4.1	2.1	4.6	1.2
21	4.5	2.7	8.7	4.5	15.2	3.7	22.8	3.8	24.6	5.9	27.0	4.5	18.1	7.1	19.7	4.3	8.5	5.5	5.0	4.6	1.8	1.9	2.3	2.2
22	5.1	1.4	10.5	3.7	11.1	8.9	20.1	4.7	27.4	2.8	22.7	7.7	10.3	7.1	19.1	6.7	14.1	2.8	4.6	4.6	1.2	1.2	1.6	1.9
23	7.0	1.3	5.9	5.8	16.7	3.5	22.3	5.7	26.9	2.9	14.3	6.1	13.5	10.7	11.6	6.6	14.5	1.9	3.3	3.5	0.0	0.0	3.6	1.1
24	5.9	1.4	8.7	5.4	16.9	2.1	21.4	4.9	26.6	2.9	17.6	8.1	24.2	4.6	17.9	4.3	14.1	1.9	6.1	5.1	1.2	1.2	4.9	1.1
25	5.8	1.3	11.7	4.8	17.6	2.1	22.6	4.8	15.4	10.5	15.7	7.2	20.1	7.6	15.1	8.4	13.9	1.9	3.2	3.0	1.0	1.0	5.4	1.3
26	4.0	3.1	12.6	2.9	15.7	2.9	16.7	9.2	15.4	8.9	16.2	10.5	17.3	8.0	20.3	2.8	13.1	2.7	7.5	2.9	2.8	2.7	2.2	1.5
27	5.6	3.0	11.7	4.8	17.3	2.2	19.6	7.5	21.0	7.7	20.9	10.8	22.1	5.9	19.5	2.3	13.4	2.1	5.4	4.4	2.1	2.2	1.8	1.6
28	4.6	4.2	9.8	6.3	12.7	5.4	21.5	5.5	24.6	6.5	19.1	6.7	24.3	3.1	12.5	9.2	8.7	3.6	7.9	1.3	3.0	2.2	1.7	1.7
29	5.8	3.0			15.8	4.7	19.0	6.1	13.4	6.1	20.6	10.0	20.6	6.6	16.0	5.4	12.4	2.5	4.8	3.5	2.6	2.3	5.4	1.2
30	6.1	1.3			12.5	5.9	23.1	4.1	16.6	8.7	20.5	10.0	22.3	7.8	12.6	6.3	13.1	1.7	5.7	3.1	1.5	1.5	1.9	1.9
31	5.9	2.4			18.7	2.3			19.0	10.1			13.9	10.7	16.5	4.6			5.2	2.0			2.1	2.1
TOTAL	131.3	62.6	231.2	103.3	394.6	124.4	471.7	178.5	626.4	224.0	609.3	256.9	631.7	212.5	601.8	155.7	415.1	118.8	223.5	110.4	107.7	57.4	96.3	50.1

COMMENTS: G= Global Radiation D= Diffuse Radiation

Shaded numbers = diffuse radiation greater than global radiation related to instrument standard error and/or instrument maladjustment

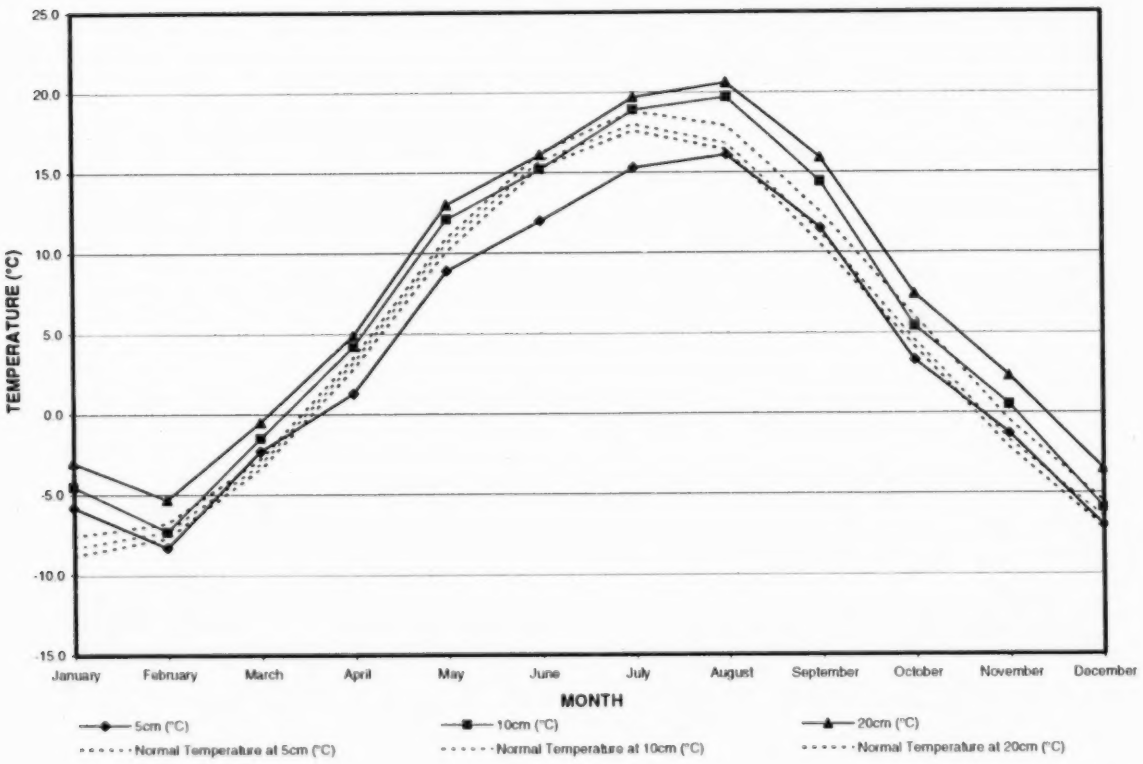
November 15, 2001 = reading at 1600h missing (1/2 hour)

Monthly Average Soil Temperatures at 0900 hours, 2001

(5 to 20 cm depths)

MONTH	5cm (°C)		10cm (°C)		20cm (°C)	
	2001	Normal	2001	Normal	2001	Normal
January	-5.8	-8.8	-4.5	-8.3	-3.0	-7.6
February	-8.3	-7.7	-7.3	-7.3	-5.3	-6.8
March	-2.3	-3.4	-1.5	-3.1	-0.5	-2.8
April	1.3	2.8	4.2	3.2	4.9	3.5
May	8.9	10.1	12.1	10.6	13.0	10.9
June	12.0	15.3	15.2	15.7	16.1	16.2
July	15.3	17.6	18.9	18.0	19.7	18.8
August	16.1	16.4	19.7	16.8	20.6	17.9
September	11.5	10.5	14.4	11.2	15.9	12.5
October	3.3	4.1	5.4	4.5	7.4	6.0
November	-1.3	-2.2	0.5	-1.7	2.3	-0.5
December	-7.0	-7.1	-5.9	-6.5	-3.5	-5.5

Normal = 1961-1990 average

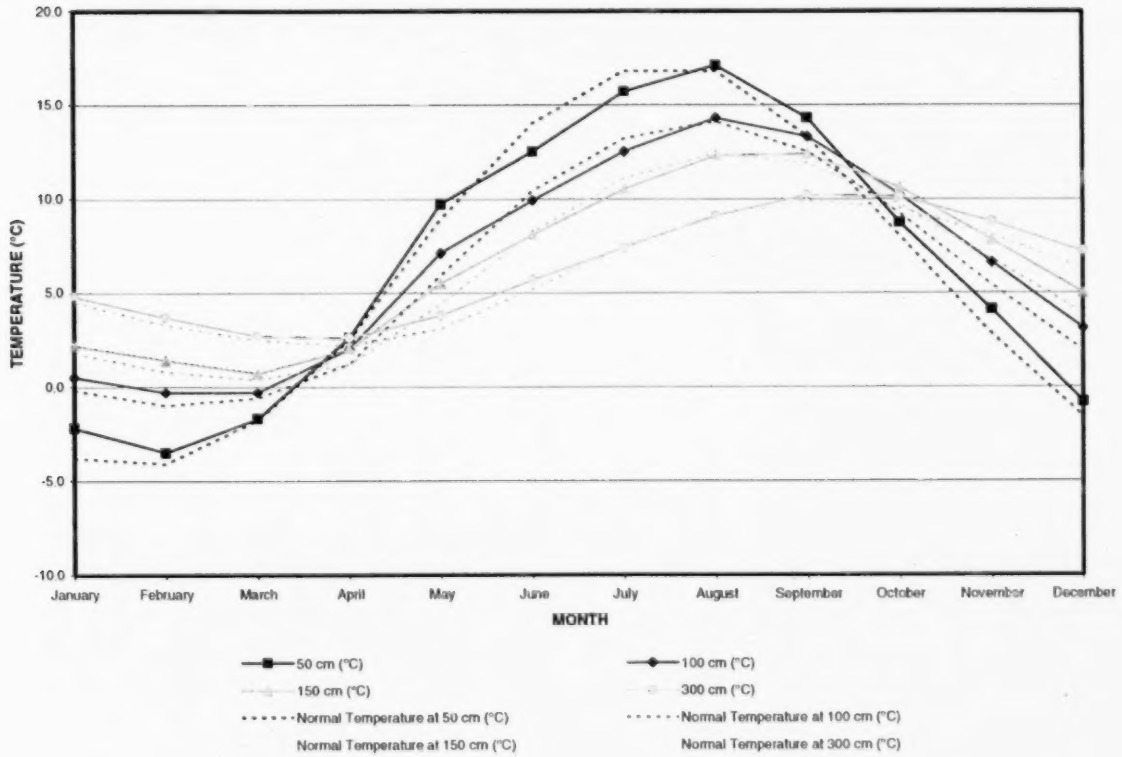


Monthly Average Soil Temperatures at 0900 hours, 2001

(50 to 300 cm depths)

MONTH	50cm (°C)		100cm (°C)		150cm (°C)		300cm (°C)	
	2001	Normal	2001	Normal	2001	Normal	2001	Normal
January	-2.2	-3.8	0.5	-0.2	2.2	1.8	4.8	4.5
February	-3.5	-4.1	-0.3	-1.0	1.4	0.8	3.7	3.3
March	-1.7	-1.8	-0.3	-0.6	0.7	0.4	2.7	2.5
April	2.6	2.5	2.0	1.2	2.0	1.2	2.6	2.2
May	9.7	8.9	7.1	5.9	5.5	4.4	3.8	3.1
June	12.5	14.0	9.9	10.4	8.1	8.2	5.7	5.2
July	15.7	16.8	12.5	13.2	10.5	11.1	7.4	7.5
August	17.1	16.8	14.3	14.1	12.3	12.4	9.1	9.1
September	14.3	13.3	13.3	12.5	12.4	11.9	10.2	9.9
October	8.7	8.0	10.2	9.2	10.6	9.7	10.1	9.5
November	4.1	2.8	6.6	5.4	7.8	6.8	8.8	8.1
December	-0.8	-1.6	3.1	1.9	5.0	3.9	7.2	6.3

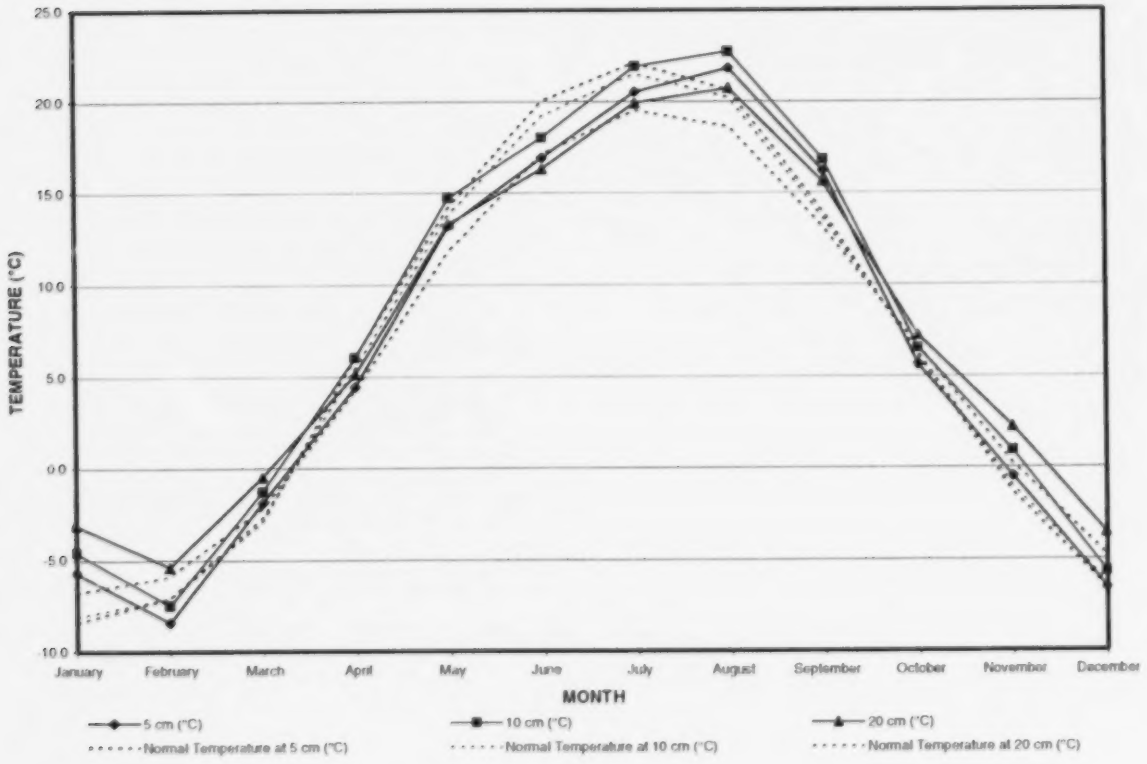
Normal = 1961-1990 average



Monthly Average Soil Temperatures at 1600 hours, 2001
(5 to 20 cm depths)

MONTH	5 cm (°C)		10 cm (°C)		20 cm (°C)	
	2001	Normal	2001	Normal	2001	Normal
January	-5.7	-8.4	-4.6	-8.1	-3.1	-6.8
February	-8.4	-7.1	-7.5	-7.1	-5.4	-5.9
March	-1.9	-2.9	-1.3	-2.7	-0.5	-2.2
April	4.4	6.0	6.0	5.4	5.1	4.2
May	13.2	14.2	14.7	13.8	13.3	11.8
June	16.9	20.0	18.0	19.2	16.3	17.1
July	20.5	22.1	21.9	21.5	19.9	19.5
August	21.8	20.6	22.7	20.2	20.7	18.6
September	16.2	13.9	16.8	13.6	15.6	13.1
October	5.6	6.1	6.5	6.2	7.2	6.6
November	-0.5	-1.4	0.9	-1.1	2.2	0.2
December	-6.6	-6.6	-5.7	-6.3	-3.6	-4.8

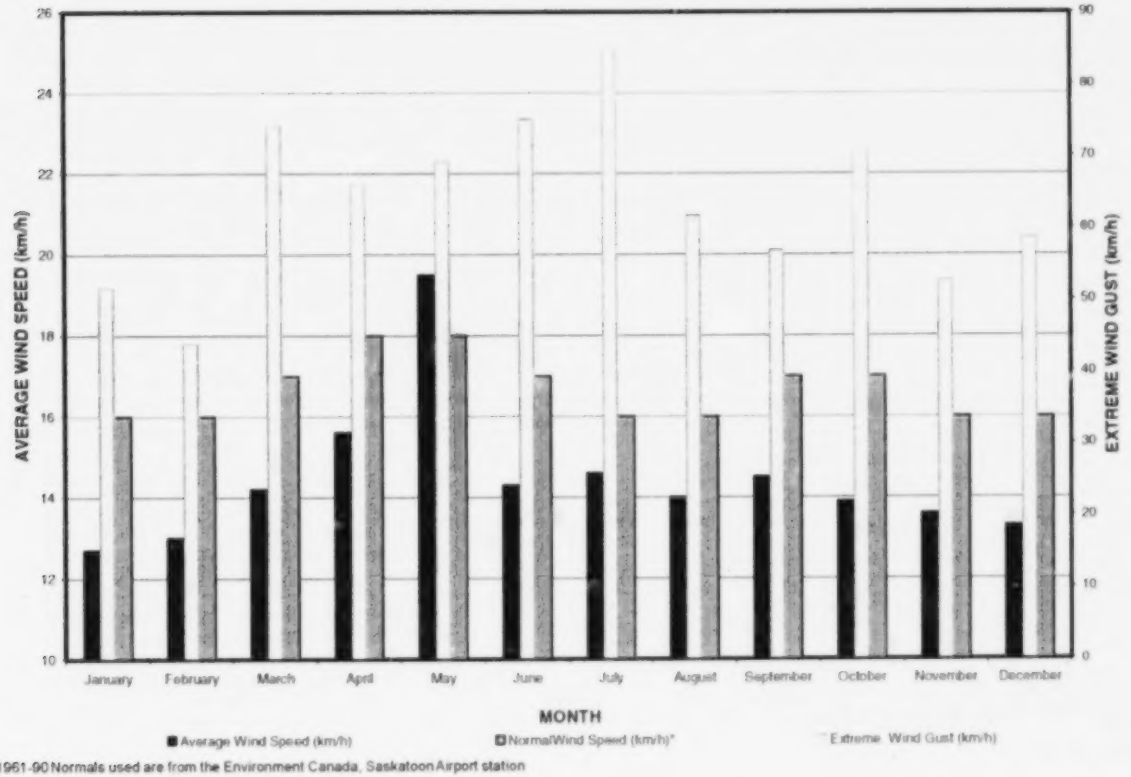
Normal = 1961-1990 average



Monthly Average Wind Speed and Exteme Gusts, 2001

MONTH	AVERAGE (km/h)		EXTREME GUST (km/h)		
	2001	Normal*	Direction	200[illegible]	Date
January	12.7	16.0	WNW	51.6	04
February	13.0	16.0	N	43.8	14
March	14.2	17.0	WSW	74.2	29
April	15.6	18.0	WNW	66.0	25
May	19.5	18.0	SSW	69.2	29
June	14.3	17.0	WSW	75.1	25
July	14.6	16.0	WNW	84.8	28
August	14.0	16.0	NW	61.6	14
September	14.5	17.0	W	56.8	02
October	13.9	17.0	W	70.8	17
November	13.6	16.0	NW	52.6	01
December	13.3	16.0	WNW	58.6	17

*1961-90 Normals used are from the Environment Canada, Saskatoon Airport station



*1961-90 Normals used are from the Environment Canada, Saskatoon Airport station

Beaufort Scale for Wind Speed

Beaufort Number	km/h	Beaufort Description	Standard Specification[1]	Revised Specification[2]
0	<2	Calm	Smoke rises vertically.	Too calm. People get edgy. Smoke from the BBQ rises straight up, attracting buzzards.
1	2 - 5	Light Air	Direction of wind shown by smoke drift but not by wind vanes.	Leaves on trees don't move. Smoke from BBQ rises at slight angle.
2	6 - 11	Light Breeze	Wind felt on face; leaves rustle; ordinary vane moved by wind.	Leaves on trees move.
3	12 - 19	Gentle Breeze	Leaves and small twigs in constant motion; wind extends light flag.	Oriental wind chimes get on your nerves.
4	20 - 29	Moderate	Wind raises dust and loose paper; small branches are moved.	Leaves fly all over your yard.
5	30 - 39	Fresh	Small trees begin to sway; crested wavelets form on inland waters.	Leaves fly over to your neighbour's yard. He yells at you but you claim you can't hear him over the wind chimes.
6	40 - 50	Strong	Large branches in motion; whistling heard in overhead wires; umbrellas used with difficulty.	Difficult to walk. Smoke from BBQ blows horizontally, right into your eyes.
7	51 - 62	Near Gale	Whole trees in motion; inconvenience felt when walking against wind.	Trees move moderately. Uncle asks, "Windy enough for you?" Cheeks flap when you yawn. Aluminum patio furniture on the move.
8	63 - 75	Gale	Breaks twigs off trees; wind generally impedes progress.	Clothes blow off clothesline. BBQ blown over - smoke from burning deck blows horizontally. Trees move rapidly.
9	76 - 87	Strong Gale	Slight structural damage occurs.	Trees move slowly - across your lawn. Uncle says, "Windy? This is nothing. When I was young..." Your favourite toque blows off.
10	88 - 102	Storm	Seldom experienced inland; trees uprooted; considerable structural damage occurs.	Your favourite shirt blows off. Neighbour's gas BBQ comes through your window. Your newly sodded lawn is now someone else's newly sodded lawn.
11	103 - 117	Violent Storm	Very rarely experienced; widespread damage.	You regret not hiring a pro to build your chimney. Uncle claims, "I've seen worse!" and is carried off by wind. People in trailer parks appear on tonight's news. Your underwear blows off.
12	118 and greater	Hurricane		Your underwear blows off while you're indoors. People from trailer parks fly past your house. Your nose hairs whistle even when you're not breathing. You can't close your eyes. Even if you wanted to.

[1]Cole, 1980
[2]Smith and Green 1995

Windchill Calculation Chart[1]

(revised 2001)

V \ T	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
5	4	-2	-7	-13	-19	-24	-30	-36	-41	-47	-53	-58
10	3	-3	-9	-15	-21	-27	-33	-39	-45	-51	-57	
15	2	-4	-11	-17	-23	-29	-35	-41	-48	-54		
20	1	-5	-12	-18	-24	-31	-37	-43	-49	-56		
25	1	-6	-12	-19	-25	-32	-38	-45	-51	-57		
30	0	-7	-13	-20	-26	-33	-39	-46	-52	-59		
35	0	-7	-14	-20	-27	-33	-40	-47	-53			
40	-1	-7	-14	-21	-27	-34	-41	-48	-54			
45	-1	-8	-15	-21	-28	-35	-42	-48	-55			
50	-1	-8	-15	-22	-29	-35	-42	-49	-56			
55	-2	-9	-15	-22	-29	-36	-43	-50	-57			
60	-2	-9	-16	-23	-30	-37	-43	-50	-57			
65	-2	-9	-16	-23	-30	-37	-44	-51	-58			
70	-2	-9	-16	-23	-30	-37	-44	-51	-59			
75	-3	-10	-17	-24	-31	-38	-45	-52	-59			
80	-3	-10	-17	-24	-31	-38	-45	-52				

where T = Air temperature (°C) and V = Observed wind speed at 10m elevation (km/h).

Approximate Thresholds:

Risk of frostbite in prolonged exposure: wind chill below	**-25**	
Frostbite possible in 10 minutes at	**-35**	Warm skin, suddenly exposed. Shorter time if skin is cool at the start.
Frostbite possible in less than 2 minutes at		Warm skin, suddenly exposed. Shorter time if skin is cool at the start.

[1] *Environment Canada 2001c*

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SASKATCHEWAN RESEARCH COUNCIL

WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	Annual Summary 2001	2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE (1892-2001)
TEMPERATURE	Average annual maximum (°C)	10.8	8.8	7.9
	Extreme annual maximum (°C/date)	39.3 /July 05	34.9 /July 14	41.0/June 1988
	Average annual minimum (°C)	-1.6	-2.9	-3.9
	Extreme annual minimum (°C/date)	-34.0 /Jan 09	-33.3 /Dec 21	-50.0/Feb. 1893
	Annual average (°C)	4.6	3.0	2.0
	Days with frost	189	198	198
	Growing degree-days (5°C base)	1980.7	1719.6	1648.4
	Heating degree-days (18°C base)	5062.6	5622.0	5954.0
	Cooling degree-days (18°C base)	219.2	128.7	117.5
PRECIPITATION	Annual total (mm)	165.8	315.4	360.8
	Greatest 24-hour (mm/date)	19.4 /July 25	24.2 /July 06	99.4 /June 1983
	Days with recordable precipitation	84	118	113
WIND	Average annual speed (km/h)	14.4	14.2	16.6
	Peak Gust (direction/speed(km/h)/date)	WNW84.8 /July 28	SSW73.3 /Oct 02	W151/Aug1967/14
RADIATION	Total bright sunshine (hours)	2497.8	2244.6	2380.8
	% of possible bright sunshine	55.7	50	53.8
	Number of days with bright sunshine	331	321	320
	Total global radiation (MJ/m²)	4540.6	4361.7	4391.9
	Total diffuse radiation (MJ/m²)	1654.6	1684.9	1729.6

FOR YOUR INFORMATION

2001

Grass temperatures are taken from a surface probe whose calibration is unknown at present.

October 4th to 10th and 26th to 30th. Power outage resulted in missed Bright sunshine data. Data for those days taken from Kernen Farm, University of Saskatchewan.[1]

2000

Janary 4th - Bright Sunsine data missing from 100h to 1200h due to equipment maintenance; day was overcast.

June 15th to 20th - Maximum and minimum temperatures not available from the site due to equipment failure; temperatues from Environment Canada, Saskatoon 'A' used in calculations.[2]

Normal and Extreme Values

The normals for CRS are taken from Environment Canada for the standard period 1961-1990.[3] Normals used in SRC CRS Annual Summaries 1990-1996 were hand-calculated values determined before the official normals were published.

Extreme values are from the Saskatoon area weather stations extending back to 1882. The earlier records from 1882 to 1901 have several gaps.

[1] University of Saskatchewan, Kernen Farm, 2001
[2] Ryback, 2001
[3] Environment Canada, 1993

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SASKATCHEWAN RESEARCH COUNCIL

MONTHLY WEATHER SUMMARY

CRS estab. 1963

Latitude 52°09'N Saskatoon Longitude 106°36'W

	JANUARY 2001		2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)		-3.0	-11.2	-12.4	
	Extreme monthly maximum (°C/date)		4.6/04	2.1/07	7.0/1986/11	10.0/1931/30
	Number of recording years				27	100
	Average monthly minimum (°C)		-12.5	-21.1	-22.6	
	Extreme monthly minimum (°C/date)		-24.0/31	-31.5/16	-43.9/1966/22&1969/29	-48.9/1893/31
	Number of recording years				27	100
	Monthly average (°C)		-7.8	-16.1	-17.4	
	Days with frost		31	31	31	
	Growing degree-days (5°C base)		0.0	0.0	0.0	
	Heating degree-days (18°C base)		799.4	1058.6	1114.8	
	Cooling degree-days (18°C base)		0.0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*		-15.0			
PRECIPITATION	Monthly total (mm)		2.6	15.5	20.5	
	Greatest 24-hour (mm/date)		1.5/31	2.5/15	15.4/1989/30	30.5/1893 /23
	Number of recording years				27	100
	Days with recordabie precipitation		3	14	11	
	Yearly total to date (mm)		2.6	15.5	20.5	
WIND	Average monthly speed (km/h)		12.7	12.3		16.0
	Peak Gust (direction/speed(km/h)/date)		WNW51.6/04	NW51.1/21		W111.0/1986/11
RADIATION	Total bright sunshine (hours)		130.0	123.5	104.6	
	% of possible bright sunshine		50.1	47.8	40.4	
	Number of days with bright sunshine		28	26	24	
	Monthly total global radiation (MJ/m²)		131.3	138.9	129.9	
	Monthly total diffuse radiation (MJ/m²)		62.6	65.0	71.4	
SOIL	Average temperature (°C) @ 9:00 am	5 cm	-5.8	-6.7	-8.8	
		10 cm/20 cm	-4.5/-3.0	-6.4/-4.2	-8.3/-7.6	
		50 cm /100 cm	-2.2/0.5	-2.1/1.1	-3.8/-0.2	
		150 cm/300 cm	2.2/4.8	2.7/5.0	1.8/4.5	

FOR YOUR INFORMATION

An inhabitant from Pierre, the Dakotian state capital in central South Dakota, would have felt at home in Saskatoon this January.[1] Temperatures soared above normal from 9.4°C (maximum) to 10.1°C (minimum). Seven days were above freezing with only one day dropping below -20°C. The mild temperatures were good news to homeowners as the heating degree-days were 28.3% less than normal. Soil temperatures were also well above normal for January. Not only was it warm, but there was little new snow to shovel with only 2.6 cm recorded by month's end. This is 87.3% less than normal. Rain, instead of snow, was even noted on the 4th. The snow-on-the-ground had only accumulated to 10cm by the 31st. Mild winds throughout the month caused little concern for frost bite caused by wind chill. Bright sunshine was 24.3% more than normal with 8 days receiving less than 1 hour of bright sunshine.

Is the climate warming? The world scientists postulate that human influences are a main reason behind the speed and severity. This is not a new theory. Thomas Jefferson also thought that a warmer climate could be attributed to human causes. In his case, he suggested that the great warmth in the 18th century was influenced by the burning and clearing of forests for settlements and cities.[2]

[1]The Weather Underground, Inc., 2001 [2]Phillips, 2000

CLIMATE STATION SUPPORTERS

Kipp & Zonen Dow AgroSciences SaskPower Ducks Unlimited Canada Saskatchewan Agriculture and Food

* Grass temperature is taken from a surface probe whose calibration is unknown at present

SASKATCHEWAN RESEARCH COUNCIL

MONTHLY WEATHER SUMMARY

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Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	FEBRUARY 2001	2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	-10.9	-4.5	-8.6	
	Extreme monthly maximum (°C/date)	3.0/03	4.0/23	7.5/1988/26&1991/06	12.8/1931/19
	Number of recording years			27	102
	Average monthly minimum (°C)	-21.4	-15.0	-18.3	
	Extreme monthly minimum (°C/date)	-34.3/09	-29.9/11	-41.1/1972/06	-50.0 /1893/1
	Number of recording years			27	102
	Monthly average (°C)	-16.2	-9.8	-13.7	
	Days with frost	28	29	28	
	Growing degree-days (5°C base)	0.0	0.0	0.0	
	Heating degree-days (18°C base)	956.6	804.9	909.9	
	Cooling degree-days (18°C base)	0.0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*	-22.0	-14.5		
PRECIPITATION	Monthly total (mm)	3.6	8.5	14.6	
	Greatest 24-hour (mm/date)	1.2/14	3.7/29	14.2/1979/13	30.0/1962/03
	Number of recording years			27	102
	Days with recordable precipitation	7	5	10	
	Yearly total to date (mm)	6.2	24.0	35.1	
WIND	Average monthly speed (km/h)	13.0	12.6		16.0
	Peak Gust (direction/speed(km/h)/date)	N43.8/14	NW42.7/29		N106.0/1988/22
RADIATION	Total bright sunshine (hours)	164.6	181.0	134.1	
	% of possible bright sunshine	58.9	62.7	48.2	
	Number of days with bright sunshine	26	26	25	
	Monthly total global radiation (MJ/m²)	231.2	235.4	210.1	
	Monthly total diffuse radiation (MJ/m²)	103.3	88.3	105.3	
SOIL	Average temperature (°C) @ 9:00 am — 5 cm	-8.3	-4.9	-7.7	
	10 cm/20 cm	-7.3/-5.3	-6.2/-4.2	-7.3/-6.8	
	50 cm /100 cm	-3.5/-0.3	-3.2/-0.1	-4.1/-1.0	
	150 cm/300 cm	1.4/3.7	1.3/3.8	0.8/3.3	

FOR YOUR INFORMATION

After the 9.6°C above normal January, February was a disappointment temperature-wise. The mean temperature was 2.5°C below normal. Eleven days recorded below -25°C with only 2 days moving the mercury above freezing. As a result of the cold weather, heating degree-days were 5% higher than normal. Despite the unseasonable cold, low wind speeds, longer daylight hours and above normal bright sunshine values encouraged people to venture outside. 2001 has been extremely dry with only 6.2 mm of precipitation recorded; 3.6 mm occurring in February. This is 82.3% below normal for the year. Upper soil temperatures reflect February's cold temperatures with below normal values while the lower soil temperatures continue the above normal trend.

What can one do during winter besides complain about the weather? You could measure the size of snowflakes. The biggest snowflake recorded in Canada, measuring 5 cm in diameter, fell in Halifax on February 22, 1986 . But Canadians have obviously had a late start in this field. The American record dates as far back as 1887 near Fort Keogh, Montana where snowflakes the size of small pizzas fell. You could take up Wilson Bentley's quest. A farmer and amateur meteorologist of Vermont, he studied and photographed over 6,000 flakes under a microscope during his life time quest to find an identical set. He died in 1931, his search unfullfilled.[1]

[1] Phillips, 1998

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SASKATCHEWAN RESEARCH COUNCIL

MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estab. 1963

	MARCH 2001	2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	2.9	4.0	-2.1	
	Extreme monthly maximum (°C/date)	13.5/19	13.7/23	17.0/1986/27	22.8/1910/23
	Number of recording years			27	101
	Average monthly minimum (°C)	-7.5	-6.0	-12.1	
	Extreme monthly minimum (°C/date)	-19.4/23	-19.3/14	-38.9/1972/02	-43.3/1897/14
	Number of recording years			27	101
	Monthly average (°C)	-2.3	-1.0	-7.0	
	Days with frost	31	26	30	
	Growing degree-days (5°C base)	0.6	5.3	1.2	
	Heating degree-days (18°C base)	629.4	589.8	784.1	
	Cooling degree-days (18°C base)	0.0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*	-5.1	-4.1		
PRECIPITATION	Monthly total (mm)	3.2	16.0	19.9	
	Greatest 24-hour (mm/date)	1.4/22	6.8 / 30	32.0/1967/30	32.0/1967/30
	Number of recording years			27	96
	Days with recordable precipitation	5	11	9	
	Yearly total to date (mm)	9.4	40.0	55.0	
WIND	Average monthly speed (km/h)	14.2	14.9		17.0
	Peak Gust (direction/speed(km/h)/date)	WSW74.2/29	WNW53.1/26		W93.0/1959/18
RADIATION	Total bright sunshine (hours)	232.0	186.4	174.6	
	% of possible bright sunshine	62.7	50.3	47.4	
	Number of days with bright sunshine	28	29	27	
	Monthly total global radiation (MJ/m²)	394.6	354.5	362.4	
	Monthly total diffuse radiation (MJ/m²)	124.4	154.3	173.9	
SOIL	Average temperature (°C) @ 9:00 am 5 cm	-2.3	-1.8	-3.4	
	10 cm/20 cm	-1.5/-0.5	-0.6/0.6	-3.1/-2.8	
	50 cm /100 cm	-1.7/-0.3	-0.8/0.3	-1.8/-0.6	
	150 cm/300 cm	0.7/2.7	1.2/2.8	0.4/2.5	

FOR YOUR INFORMATION

March entered like a lamb, roared like a lion and then exited like a lamb. Even with cooler temperatures from the 20th to 25th, the mean temperature was 4.7°C above normal. Twenty-one days recorded above 0°C temperatures with 10 of these days recording above 0°C for the mean. Measurable precipitation, totalling 3.2mm, was recorded on 5 days; 83.9% less than normal. Since last September, the station has not recorded above normal precipitation. With dry March skies, the bright sunshine was 32.9% above normal; 57.4 more hours of bright sunshine to enjoy along with the warm temperatures. Gale winds (63-75 kph) and Near Gale winds (51-62 kph) occurred twice each during the latter two-thirds of March. The pleasant month encouraged the return of the gophers on the 8th and the geese on the 9th.

The United Nations have declared 2001 'International Year of Volunteers'. Beginning with the fur traders recording general weather descriptions similar to entries in ships' logs, to present day manual instrument observers, weather records in Canada owe much to volunteer observers. The early 1800s trading post of Cumberland House, fortunate to possess a thermometer, recorded temperature along with the general description of wind and storms faced by the early adventurers. Alas, 99% of these early post records have not survived. However, the surviving accounts do provide an insight into that era's weather thanks to the volunteer observers.[1]

[1] Russell, 2001

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SASKATCHEWAN RESEARCH COUNCIL

MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	APRIL 2001		2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)		12.1	10.9	9.9	
	Extreme monthly maximum (°C/date)		31.5/28	23.8/22	31.5/2001/28	33.3/1952/28
	Number of recording years				27	101
	Average monthly minimum (°C)		-1.7	-1.3	-2.0	
	Extreme monthly minimum (°C/date)		-13.2/15	-12.0/14	-27.8/1979/01	-28.3/1893/05&1954/02
	Number of recording years				27	101
	Monthly average (°C)		5.2	4.8	4.0	
	Days with frost		18	20	20	
	Growing degree-days (5°C base)		82.8	78.7	54.8	
	Heating degree-days (18°C base)		387.4	396.3	420.9	
	Cooling degree-days (18°C base)		3.1	0.0	0.2	
	Average Grass @ 9:00 am (surface)*		6.0	6.7		
PRECIPITATION	Monthly total (mm)		6.4	28.8	20.3	
	Greatest 24-hour (mm/date)		2.0/07	9.0/05	24.6/1985/19	30.2/1955/19
	Number of recording years				27	101
	Days with recordable precipitation		9	13	7	
	Yearly total to date (mm)		15.8	68.8	75.3	
WIND	Average monthly speed (km/h)		15.6	15.8		18.0
	Peak Gust (direction/speed(km/h)/date)		WNW66.0/25	NNW64.5/05		W108.0/1959/06
RADIATION	Total bright sunshine (hours)		217.5	203.2	229.4	
	% of possible bright sunshine		51.9	48.5	54.9	
	Number of days with bright sunshine		26	28	27	
	Monthly total global radiation (MJ/m²)		471.7	470.6	492.2	
	Monthly total diffuse radiation (MJ/m²)		178.5	192.8	178.5	
SOIL	Average temperature (°C) @ 9:00 am	5 cm	1.3	2.3	2.8	
		10 cm/20 cm	4.2/4.9	4.6/5.8	3.2/3.5	
		50 cm /100 cm	2.6/2.0	3.4/2.8	2.5/1.2	
		150 cm/300 cm	2.0/2.6	2.5/2.7	1.2/2.2	

FOR YOUR INFORMATION

If 'April showers bring forth May flowers' then we can expect few flowers this May. Even though there was a higher number of recordable precipitation days, the station received 13.9 mm less than normal. It was the 6th driest April at the station since 1963 with only 1967, 1986, 1988, 1989 and 1994 being drier. Since the beginning of the year, we have received one-fifth of the usual amount of precipitation aggravating the very dry year-end conditions. Aided by an extreme record temperature on April 28th at 31.5°C and temperatures reaching into 20's thrice, average monthly temperatures were above normal. The growing-degree days increased by 51% because there was 2 days more than normal without frost. Bright sunshine was absent one day more than normal with a decrease of 5.2% over the expected amount. Frost was no longer recorded in the soil by month's end. Soil temperature averages were all above normal with the exception of the 5cm level. Winds were brisk and frequent during the month. 'Near gale' winds (51-62 kph) occurred 6 times while 'gale' winds (63-75 kph) occurred once.

On April 28, 1990 a storm dropped 15cm of snow in 48 hours on Saskatoon. It caused a 29-car pile-up on the Idylwyld Freeway and even closed Victoria Bridge. What would we give for that snow this year, minus, of course, all the problems it caused.[1]

[1]Phillips, 1999.

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SASKATCHEWAN RESEARCH COUNCIL

MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estab. 1963

	MAY 2001	2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	20.7	18.1	18.5	
	Extreme monthly maximum (°C/date)	31.5/13	28.3/01	35.0/1988/30	37.2/1936/27
	Number of recording years			27	101
	Average monthly minimum (°C)	5.6	3.9	4.5	
	Extreme monthly minimum (°C/date)	-1.9/03	-6.1/12	-10.0/1967/02	-12.8/1907/06
	Number of recording years			27	101
	Monthly average (°C)	13.2	11.0	11.6	
	Days with frost	3	6	6	
	Growing degree-days (5°C base)	253.2	191.6	206.9	
	Heating degree-days (18°C base)	155.2	216.3	193.1	
	Cooling degree-days (18°C base)	5.4	0.0	7.0	
	Average Grass @ 9:00 am (surface)*	16.0	14.7		
PRECIPITATION	Monthly total (mm)	24.4	13.0	43.7	
	Greatest 24-hour (mm/date)	14.2/19	4.8/22	39.9/1985/04	51.3/1909/30
	Number of recording years			27	101
	Days with recordable precipitation	5	8	9	
	Yearly total to date (mm)	40.2	81.8	119.0	
WIND	Average monthly speed (km/h)	19.5	16.9		18.0
	Peak Gust (direction/speed(km/h)/date)	SSW69.2/29	WNW68.6/22		SW132/1965/17
RADIATION	Total bright sunshine (hours)	276.4	226.6	285.7	
	% of possible bright sunshine	56.7	46.4	58.7	
	Number of days with bright sunshine	31	30	29	
	Monthly total global radiation (MJ/m^2)	626.4	582.6	586.3	
	Monthly total diffuse radiation (MJ/m^2)	224.0	236.1	222.2	
SOIL	Average temperature (°C) @ 9:00 am 5 cm	8.9	7.9	10.1	
	10 cm/20 cm	12.1/13.0	10.3/11.5	10.6/10.9	
	50 cm /100 cm	9.7/7.1	8.5/6.8	8.9/5.9	
	150 cm/300 cm	5.5/3.8	5.7/4.0	4.4/3.1	

FOR YOUR INFORMATION

Rocks in the pockets would have been prudent this May to counteract the wind. Maximum wind gusts reached 'Near Gale' conditions (51-62 kph) on 13 days and 'Gale' conditions (63-75 kph) on an additional 2 days. Precipitation, 55.8% of normal, occurred in the latter part of the month with 78.9% of the total falling on the 19th & 20th. The below normal May rainfall dropped the current annual precipitation to 33.8% of normal. Newspapers are reporting record dry conditions; even the Dirty '30s were not as dry.[1] Temperatures were 1.6°C above normal on average. Frost was recorded thrice with the last occurrence on the 10th. May's frost -free growing degree-days totalled 189.8 compared to 253.2 for the monthly growing degree-days. As expected, heating degree-days were lower but so were cooling degree-days indicating a lack of very hot days. Bright sunshine was 9.3 hours less than average even though every day received at least 1 hour of bright sunshine.

High spring winds can reek havoc with more than roofs and power lines. In Edmonton, 1999, high winds of up to 74 kph tore off a roof and blew power lines together causing short circuits. That was considered a minor inconvenience to the many high school girl graduates who had had their hair styled for the celebrations. The wind forced a huge run on hair spray and pins to keep everything in place.[2] [1] Saskatoon StarPhoenix , 2001 [2] Phillips, 2000

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Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	JUNE 2001	2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	22.7	21.4	22.6	
	Extreme monthly maximum (°C/date)	31.7/21	30.6/29	41.0/1988/05	40.6/1988/05
	Number of recording years			27	102
	Average monthly minimum (°C)	9.3	8.7	9.2	
	Extreme monthly minimum (°C/date)	3.8/13	4.7/08	-3.3/1967/06	-3.9/1903.0/09&1917/02
	Number of recording years			27	102
	Monthly average (°C)	16.0	15.1	15.9	
	Days with frost	0	0	0	
	Growing degree-days (5°C base)	330.9	302.1	327.3	
	Heating degree-days (18°C base)	75.5	97.5	84.0	
	Cooling degree-days (18°C base)	16.4	9.6	21.2	
	Average Grass @ 9:00 am (surface)*	18.8	19.9		
PRECIPITATION	Monthly total (mm)	36.0	48.8	63.6	
	Greatest 24-hour (mm/date)	9.0/09	14.2/09	99.4/1983/24	99.4/1983/24
	Number of recording years			27	102
	Days with recordable precipitation	10	16	12	
	Yearly total to date (mm)	76.2	130.6	182.6	
WIND	Average monthly speed (km/h)	14.3	15.1		17.0
	Peak Gust (direction/speed(km/h)/date)	WSW75.1/25	E61.0/09		S117.0/1986/01
RADIATION	Total bright sunshine (hours)	245.9	239.2	297.2	
	% of possible bright sunshine	49.2	47.8	59.4	
	Number of days with bright sunshine	30	27	29	
	Monthly total global radiation (MJ/m²)	609.3	609.9	638.7	
	Monthly total diffuse radiation (MJ/m²)	256.9	231.6	228.1	
SOIL	Average temperature (°C) @ 9:00 am — 5 cm	12.0	11.7	15.3	
	10 cm/20 cm	15.2/16.1	14.4/15.5	15.7/16.2	
	50 cm /100 cm	12.5/9.9	11.8/9.5	14.0/10.4	
	150 cm/300 cm	8.1/5.7	8.0/3.3	8.2/5.2	

FOR YOUR INFORMATION

The term "normal" climatically speaking, means an average usually taken over a standard period of 30 years. The actual averages for an individual month only occasionally hit the "normal". This June the average temperatures were only 0.1°C above the normal value. With the average temperatures being so close to the normal, the degree-days which are calculated from the daily average temperatures, are also very close to normal. Precipitation is another story. The station received only 56.6% of the normal precipitation. This is the 10th consecutive month of below normal precipitation. We have only received 41.7% of the normal precipitation for the year. To date, the newspapers are reporting 2001 as the driest year on record for Saskatoon; even drier than the record year of 1988.[1] Even though we had two less rainfall events and all days recorded bright sunshine, the bright sunshine was 17.3% less than normal.

Lightning storms have not been a problem so far this year. But about 16 million thunderstorms do strike the earth every year. On average, lightning strikes the earth 50 to 100 times every second. In the northern hemisphere, two thirds of the strikes strike during the summer months of June, July and August and mostly in the afternoon. It does not need to be raining for lightning to occur. It often strikes outside of heavy rain area in a storm and may occur as far as 16 km away from rainfall.[2]

[1]Robinson 2001 [2]Environment Canada (no date).

CLIMATE STATION SUPPORTERS

Kipp & Zonen Dow AgroSciences SaskPower Ducks Unlimited Canada Saskatchewan Agriculture and Food

* Grass temperature is taken from a surface probe whose calibration is unknown at present

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SASKATCHEWAN RESEARCH COUNCIL

MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estab. 1963

	JULY 2001	2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	27.6	25.7	25.1	
	Extreme monthly maximum (°C/date)	39.3/05	34.9/14	39.3/2001/05	40.0/1919/17&1941/19&1946/30
	Number of recording years				102
	Average monthly minimum (°C)	13.0	13.1	11.5	
	Extreme monthly minimum (°C/date)	6.7/04	4.9/17	1.7/1967/02&1978/09	-0.6/1918/25
	Number of recording years			27	102
	Monthly average (°C)	20.3	19.4	18.3	
	Days with frost	0	0	0	
	Growing degree-days (5°C base)	475.7	447.2	414.8	
	Heating degree-days (18°C base)	10.8	26.0	32.0	
	Cooling degree-days (18°C base)	83.5	70.2	43.9	
	Average Grass @ 9:00 am (surface)*	23.2	23.5		
PRECIPITATION	Monthly total (mm)	48.2	82.4	55.7	
	Greatest 24-hour (mm/date)	19.4/25	24.2	45.5/1968/29	79.2/1946/03
	Number of recording years			27	102
	Days with recordable precipitation	11	9	11	
	Yearly total to date (mm)	124.4	213.0	238.3	
WIND	Average monthly speed (km/h)	14.6	13.8		16.0
	Peak Gust (direction/speed(km/h)/date)	WNW84.8/28	SSW73.3/14		E113.0/1955/05
RADIATION	Total bright sunshine (hours)	282.5	267.6	330.3	
	% of possible bright sunshine	56.3	53.4	65.8	
	Number of days with bright sunshine	31	31	30	
	Monthly total global radiation (MJ/m^2)	631.7	620.3	633.5	
	Monthly total diffuse radiation (MJ/m^2)	212.5	212.9	216.5	
SOIL	Average temperature (°C) @ 9:00 am — 5 cm	15.3	14.7	17.6	
	10 cm/20 cm	18.9/19.7	17.9/18.9	18.0/18.8	
	50 cm /100 cm	15.7/12.5	15.4/12.3	16.8/13.2	
	150 cm/300 cm	10.5/7.4	10.4/7.4	11.1/7.5	

FOR YOUR INFORMATION

July was hot. The average maximum temperature at 27.6°C was 2.5°C above normal. Seventeen days registered above 27°C with 8 of those days above 30°C. On the 5th, a new maximum record of 39.3°C was set breaking the old record, set on July 27th, 1984, by 0.8°C. Just the day before, the minimum temperature for the month had been recorded. Within 33 hours, a change of 32.8°C had occurred. The hot weather was greatly reflected in the degree-days. A decrease of 66% in heating degree-days along with a 90% increase in cooling degree-days were recorded. Extreme-cooling-degree-days (base 24°C) were 423.5% of normal. So what was saved on heating, probably was spent on cooling. Precipitation was again below normal by 13.5%; increasing the yearly total to 52.2% of normal. Seventy-seven percent of the rain fell between the 22nd and 29th accompanied by thunder and lightning storms. An impressive pyrotechnical display was featured during the evening of the 28th. Wind of over 84 km/h just added to the show.

The risk of dying from a lightning bolt is 1:2 million; death from falling out of bed is just as likely. If those odds are not to your liking, you can decrease them by not doing the dishes during a storm. You should also not talk on the telephone, take a shower or bath, or have any contact with conductive surfaces with outside exposure such as doors, window frames or cable TV. And never, ever stand up in a boat on a lake and yell at the sky, "Here I am" as one man, now deceased, from Lake Bistineau near Los Angeles did.[1]

[1] Phillips, 1996b and Canadian Geographic Society, no date.

CLIMATE STATION SUPPORTERS

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SASKATCHEWAN RESEARCH COUNCIL

MONTHLY WEATHER SUMMARY

CRS estbd. 1963

Latitude 52°09'N Saskatoon Longitude 106°36'W

	AUGUST 2001		2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)		29.2	24.4	24.3	
	Extreme monthly maximum (°C/date)		37.8/03	34.5/23	39.7/1998/06	39.7/1998/06
	Number of recording years				27	101
	Average monthly minimum (°C)		12.7	11.1	10.1	
	Extreme monthly minimum (°C/date)		5.9/12	4.5/31	-2.8/1976/28	-2.8/1976/28&1901/23
	Number of recording years				27	101
	Monthly average (°C)		21.0	17.8	17.2	
	Days with frost		0	0	0	
	Growing degree-days (5°C base)		495.1	395.4	379.6	
	Heating degree-days (18°C base)		8.9	49.6	62.4	
	Cooling degree-days (18°C base)		101.0	42.0	39.0	
	Average Grass @ 9:00 am (surface)*		23.5	19.2		
PRECIPITATION	Monthly total (mm)		7.0	52.6	35.3	
	Greatest 24-hour (mm/date)		6.0/14	23.4/02	33.8/1998/17	84.3/1945/03
	Number of recording years				27	101
	Days with recordable precipitation		2	10	9	
	Yearly total to date (mm)		131.4	265.6	273.6	
WIND	Average monthly speed (km/h)		14.0	13.6		16.0
	Peak Gust (direction/speed(km/h)/date)		NW61.6/14	NW55.2/28		W151.0/1967/14
RADIATION	Total bright sunshine (hours)		332.4	249.4	295.2	
	% of possible bright sunshine		73.5	55.2	65.2	
	Number of days with bright sunshine		31	30	30	
	Monthly total global radiation (MJ/m²)		601.8	518.6	529.0	
	Monthly total diffuse radiation (MJ/m²)		155.7	176.1	185.6	
SOIL	Average temperature (°C) @ 9:00 am	5 cm	16.1	13.9	16.4	
		10 cm/20 cm	19.7/20.6	17.2/18.5	16.8/17.9	
		50 cm /100 cm	17.1/14.3	16.0/13.8	16.8/14.1	
		150 cm/300 cm	12.3/9.1	12.2/9.1	12.4/9.1	

FOR YOUR INFORMATION

August was hot - very hot. Twenty-four days had temperatures soaring above 27°C. For 12 of those days, the temperature climbed above 30°C. It is no wonder the average maximum temperature was 29.2°C; 4.9°C above normal. With the high temperatures any savings realized by the minuscule heating degree-days were greatly offset by the high cost of cooling. Extreme-cooling-degree-days (base 24°C) occurred on 7 days with a total of 10.3; 8.8 above normal. The 10 and 20 cm level average soil temperatures were almost 3°C higher than normal. Unusual with the high temperatures was the lack of violent thunderstorms and rain. Only 2 days produced rain for a total of 7mm. Yearly precipitation stands at 52.0% below normal. Although the growing degree-days were 115.5 units above normal, without rain not much growth occurred. With the hot weather came clear skies and an extra 37.2 hours of bright sunshine. Every day experienced at least 3 hours of bright sunshine with a monthly average of 10.7 hours per day.

With the hot dry weather, this August is a far cry from the August of 1987. Prairie weather was significantly cooler and wetter than normal, with record daily low temperatures being set in several localities. This caused a slump in beer sales so great, it forced a temporary shutdown of a Calgary brewery. [1]

[1]Phillips 1996a

CLIMATE STATION SUPPORTERS

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SASKATCHEWAN RESEARCH COUNCIL

MONTHLY WEATHER SUMMARY

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Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estab. 1963

	SEPTEMBER 2001		2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)		22.4	19.3	17.7	
	Extreme monthly maximum (°C/date)		33.2/25	29.7/17	35.6 /1978 /04	35.6 /1978 /04
	Number of recording years				27	101
	Average monthly minimum (°C)		7.1	6.1	4.9	
	Extreme monthly minimum (°C/date)		0.5/12	-2.5/23	-7.8 /1974 /30	-11.1/1908/28
	Number of recording years				27	101
	Monthly average (°C)		14.8	12.7	11.3	
	Days with frost		0	2	5	
	Growing degree-days (5°C base)		294.0	236.4	197.1	
	Heating degree-days (18°C base)		105.8	165.4	206.8	
	Cooling degree-days (18°C base)		9.8	6.9	6.2	
	Average Grass @ 9:00 am (surface)*		11.8	10.3		
PRECIPITATION	Monthly total (mm)		11.4	22.1	32.9	
	Greatest 24-hour (mm/date)		6.4/19	13.6/02	29.6/1980/03	44.2 /1931/12
	Number of recording years				27	101
	Days with recordable precipitation		8	9	9	
	Yearly total to date (mm)		142.8	287.7	306.5	
WIND	Average monthly speed (km/h)		14.5	15.6		17.0
	Peak Gust (direction/speed(km/h)/date)		W56.8/02	NW66.3/30		W148/1967/22
RADIATION	Total bright sunshine (hours)		265.3	191.6	184.4	
	% of possible bright sunshine		70.0	50.7	48.6	
	Number of days with bright sunshine		30	29	27	
	Monthly total global radiation (MJ/m²)		415.1	357.2	351.8	
	Monthly total diffuse radiation (MJ/m²)		118.8	128.6	127.6	
SOIL	Average temperature (°C) @ 9.00 am	5 cm	11.5	8.6	10.5	
		10 cm/20 cm	14.4/15.9	11.5/13.2	11.2/12.5	
		50 cm /100 cm	14.3/13.3	12.3/12.1	13.3/12.5	
		150 cm/300 cm	12.4/10.2	11.6/9.9	11.9 /9.9	

FOR YOUR INFORMATION

Bright skies, dry conditions and hot days describe September 2001. All three conditions are far from normal. Outdoor enthusiast enjoyed 81 hours more (43.9% higher) bright sunshine than normal. Every day brought bright sunshine with only one day recording below 2 hours. Below normal dry conditions persist for the 13th month. Rainfall amounted to 34.7% of normal increasing the yearly total to 46.6% of normal. Snow flurries were observed south of Saskatoon during the early morning of the 8th.[1] Frost has yet to be recorded at the site. Three new daily maximum temperatures for CRS were set. The old record of 31.0°C for the 3rd set in 1981 has been replaced by 32.2°C; 33.2°C replaces 29.6°C for the 25th, 1997 and 28.0°C replaces 26.6°C for the 27th, 1973. September 4th, 1978 remains the hottest day for the month at 35.6°C.

On the prairies, winter forecasts have always been conversational openers. Environment Canada is predicting warmer than usual fall and winter temperatures.[2] The Old Farmers' Almanac forecasts cold temperatures for early December, January, mid February and early March. To do your own prognostication; check the onions. "*Onion's skin very thin, Mild winter coming in. Onion's skin thick and tough, coming winter cold and rough.*"[3] Woolly bear caterpillars, with their three distinct colour bands, indicate winter's weather as being long and white when the middle band is wide.[4]

[1]Beatty 2001 [2]Environment Canada 2001b [3]Thomas 2001 [4]Lalonde 1994.

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SASKATCHEWAN RESEARCH COUNCIL

MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	OCTOBER 2001		2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)		9.1	12.5	10.9	
	Extreme monthly maximum (°C/date)		19.6/01	23.9/10	28.5/1984/08	32.2/1943/05
	Number of recording years				27	99
	Average monthly minimum (°C)		-2.3	-1.9	-1.3	
	Extreme monthly minimum (°C/date)		-12.0/25	-10.4/06	-21.5/1984/30&31	-25.6/1919/26
	Number of recording years				28	99
	Monthly average (°C)		3.4	5.3	4.8	
	Days with frost		20	24	19	
	Growing degree-days (5°C base)		39.7	57.8	61.5	
	Heating degree-days (18°C base)		451.9	392.2	406.5	
	Cooling degree-days (18°C base)		0.0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*		-1.5	0.6		
PRECIPITATION	Monthly total (mm)		8.3	trace	17.5	
	Greatest 24-hour (mm/date)		4.5/22	trace	36.7/1984/16	41.7/1969/03
	Number of recording years				27	99
	Days with recordable precipitation		9	0	6	
	Yearly total to date (mm)		151.1	287.7	324.0	
WIND	Average monthly speed (km/h)		13.9	8.4		17.0
	Peak Gust (direction/speed(km/h)/date)		W70.8/17	NNW73.0/02		NW138/1967/16
RADIATION	Total bright sunshine (hours)		[1]145.3	192.2	160.7	
	% of possible bright sunshine		44.2	58.5	48.8	
	Number of days with bright sunshine		26	28	27	
	Monthly total global radiation (MJ/m²)		223.5	255.6	239.1	
	Monthly total diffuse radiation (MJ/m²)		110.4	85.7	92.6	
SOIL	Average temperature (°C) @ 9:00 am	5 cm	3.3	2.8	4.1	
		10 cm/20 cm	5.4/7.4	5.5/7.4	4.5/6.0	
		50 cm /100 cm	8.7/10.2	8.0/9.1	8.0/9.2	
		150 cm/300 cm	10.6/10.1	9.6/9.5	9.7/9.5	

FOR YOUR INFORMATION

Dry, dull and cool describe this October. Below average temperatures and an extra frost day made the final garden clean up not as pleasant as last year when we enjoyed a textbook Indian Summer. The first fall frost, on October 4th, officially closed the growing season with 146 frost-free days and 1797.6 frost-free growing degree-days. As 'near gale' or 'gale' winds (51-75 km/h) only occurred thrice during the month, they rarely added unpleasantness to the cool days. Bright sunshine was 9.6% less than normal. Drought conditions persisted even though precipitation was recorded on 3 days more than usual. The yearly total at 46.6% of normal is heading towards being one of the driest years on record at the site. The first substantial snow fall occurred on the 22nd but had melted long before Hallowe'en. Hallowe'en evening was pleasant but still damp from the morning's shower of rain. A gopher was still active at the site by month's end.

With the shortening of the days, autumn can experience great daily variations in temperatures as Dauphinites can attest. On October 3rd, 1999, they received the dubious honour of being Manitoba's cold spot with morning temperatures of -8.6°C but by the afternoon the temperature had risen to 7°C making Dauphin the hottest place in Manitoba.[2]

[1] Power outage from Oct. 4-10 & Oct. 26-30 caused missing data for Bright sunshine. Data for those days taken from University of Saskatchewan, Kernen Farm, U of S. [2] Phillips 2000

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SASKATCHEWAN RESEARCH COUNCIL

MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estab. 1963

	NOVEMBER 2001	2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	3.9	-0.7	-1.5	
	Extreme monthly maximum (°C/date)	16.3/04	16.0/04	19.4/1975/04	21.7/1903/03
	Number of recording years			28	100
	Average monthly minimum (°C)	-5.2	-9.4	-10.6	
	Extreme monthly minimum (°C/date)	-14.2/26	-19.0/08	-33.5/1985/24	-39.4/1893/30
	Number of recording years			28	100
	Monthly average (°C)	-0.7	-5.1	-6.0	
	Days with frost	27	29	29	
	Growing degree-days (5°C base)	8.7	5.1	2.8	
	Heating degree-days (18°C base)	560.6	691.8	721.5	
	Cooling degree-days (18°C base)	0.0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*	-7.1	-11.5		
PRECIPITATION	Monthly total (mm)	6.8	9.1	15.5	
	Greatest 24-hour (mm/date)	3.4/08	3.3/27	19.3/1978/04	27.9/1938/01
	Number of recording years			28	100
	Days with recordable precipitation	7	10	8	
	Yearly total to date (mm)	159.9	296.8	339.5	
WIND	Average monthly speed (km/h)	13.6	13.5		16.0
	Peak Gust (direction/speed(km/h)/date)	NW52.6/01	NW58.6/18		W100.0/1976/17
RADIATION	Total bright sunshine (hours)	103.6	104.5	100.9	
	% of possible bright sunshine	39.3	39.7	38.1	
	Number of days with bright sunshine	20	20	22	
	Monthly total global radiation (MJ/m²)	107.4	127.1	123.7	
	Monthly total diffuse radiation (MJ/m²)	57.4	60.6	73.6	
SOIL	Average temperature (°C) @ 9:00 am 5 cm	-1.3	-2.1	-2.2	
	10 cm/20 cm	0.5/2.3	-0.2/1.7	-1.7/-0.5	
	50 cm /100 cm	4.1/6.6	3.6/6.3	2.8/5.4	
	150 cm/300 cm	7.8/8.8	7.4/8.5	6.8/8.1	

FOR YOUR INFORMATION

For the 15th consecutive month, below normal monthly precipitation occurred. Measurable precipitation was recorded on 7 days, with 73% of the monthly total occurring on the 8th and 30th. The yearly precipitation is 179.6 mm or 47.1% of normal. Temperatures, both the maximum and minimum, were a whopping 5.4°C above normal. Not until the 22nd, did the maximum temperature slip below 0°C. On 3 occasions, the minimum temperature did not fall below the zero mark. With the mild temperatures, the heating degree-days were down 22.3%. The soil temperatures ranged from 2.8°C (20cm) to 0.7°C (300cm) above normal. Bright sunshine was only 2 days less than normal but 4 days recorded over 90% of possible radiation. With the last minute snow fall, the end of the month snow-on-the-ground measurement was 7cm.

The "Greenhouse Effect" is not new terminology. Alexander Graham Bell used the term when he described his concern over the depletion of the earth's fossil fuels. He felt that polluting the atmosphere wouldn't cool the earth, as generally thought around 1922, but warm it. Thomas Jefferson used the term "Global Warming" around the turn of the 19th century to describe a period of warmth in the 18th century which he ascribed to burning and clearing of forests[1]. [1] Phillips, 2000 & 2001

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MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	DECEMBER 2001		2001 VALUE	2000 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)		-6.7	-14.0	-9.8	
	Extreme monthly maximum (°C/date)		6.3/17	2.2/06	9.5/1987/07	14.4/1939/05
	Number of recording years				28	100
	Average monthly minimum (°C)		-16.6	-23.0	-19.3	
	Extreme monthly minimum (°C/date)		-24.0/06	-33.3/21	-42.2/1973/31	-43.9/1892/22
	Number of recording years				28	100
	Monthly average (°C)		-11.7	-18.5	-14.5	
	Days with frost		31	31	31	
	Growing degree-days (5°C base)		0.0	0.0	0.0	
	Heating degree-days (18°C base)		921.1	1132.4	1004.8	
	Cooling degree-days (18°C base)		0.0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*		-18.2	-22.6		
PRECIPITATION	Monthly total (mm)		5.9	16.9	21.3	
	Greatest 24-hour (mm/date)		3.4	5.1/19	14.5/1973/23	28.4/1936/02
	Number of recording years				28	100
	Days with recordable precipitation		7	13	12	
	Yearly total to date (mm)		165.8	313.7	360.8	
WIND	Average monthly speed (km/h)		13.3	12.5		16.0
	Peak Gust (direction/speed(km/h)/date)		WNW58.6/17	SE50.7/17		W121/1955/12
RADIATION	Total bright sunshine (hours)		102.3	79.2	83.7	
	% of possible bright sunshine		42.3	32.7	34.5	
	Number of days with bright sunshine		24	17	23	
	Monthly total global radiation (MJ/m²)		96.3	91.0	95.2	
	Monthly total diffuse radiation (MJ/m²)		50.1	52.9	54.3	
SOIL	Average temperature (°C) @ 9:00 am	5 cm	-7.0	-8.1	-7.1	
		10 cm/20 cm	-5.9/-3.5	-7.0/-4.7	-6.5/-5.5	
		50 cm /100 cm	-0.8/3.1	-1.7/2.5	-1.6/1.9	
		150 cm/300 cm	5.0/7.2	4.4/6.7	3.9/6.3	

FOR YOUR INFORMATION

The first December of the new millennium closed the driest year recorded at Saskatoon[1] and CRS. CRS received 46% of normal yearly precipitation while the airport also reported 46%.[1] With only 5.9 mm measured, December was the 16th consecutive month of below normal monthly precipitation. Bright sunshine hours were 18.6 hours above normal reflecting the 5 days less precipitation days. Temperatures for December were 3.1° and 2.7°C above normal for the average maximum and minimum respectively. Five days were above 0°C with 8 days falling between -20° and -24°C. Soil temperatures at all levels were above normal with frost not yet being recorded at the 100cm level.

With the lack of precipitation, the office of 'rainmaker' may make a comeback. During the 1933 drought the US Weather Bureau received many suggestions of ways to end the dryness including the use of explosives. Others suggested installing deflecting planes along the crest of the Rocky Mountains to alter the course of the air currents. One inventive person suggested attaching hoses to mile-high balloons to draw moist air down to ground level and condense the moisture out of it. Other enterprising individuals offered to sell their sure-fire *secret* methods of creating rain to the US government for a mere $25 million. The government declined.[2]

[1]Robinson 2002 & Environment Canada, Meteorological Service of Canada, 2002 [2]Phillips 2000

CLIMATE STATION SUPPORTERS

Kipp & Zonen Dow AgroSciences SaskPower Saskatchewan Agriculture and Food

* Grass temperature is taken from a surface probe whose calibration is unknown at present

INSTRUMENTS USED AT SASKATOON SRC CRS AND GLOSSARY OF TERMS

(unless otherwise stated, source for definitions of terms is Environment Canada, 1978)

BEAUFORT WIND SCALE was developed by Admiral Sir Francis Beaufort in 1805 and adopted by the British Navy in 1838. It consisted of 13 degrees of wind strength, from calm to hurricane, based upon the effects of various wind strengths upon the amount of canvas carried by the fully rigged frigates of the period. Over the years it has been modified as needed and in 1946 the scale values (Force Numbers) were defined by ranges of wind speed as measured at a height of 10 meters above the surface. In effect, this transformed the 'Beaufort Wind Force Scale' into the 'Beaufort Wind Speed Scale'. This scale is the current standard scale for visual observations of the wind (Heidorn, 1998).

BRIGHT SUNSHINE is the unobstructed direct radiation from the sun, as opposed to the shading of a location by clouds or by other atmospheric obstructions.

Number of Days is defined as the total number of days when at least 0.1 of an hour of bright sunshine was recorded.

Percentage Possible refers to the ratio of measured bright sunshine hours to the total possible daylight hours in a given period, expressed as a percentage.

Possible daylight hours are taken from the sunrise/set tables provided by the National Research Council of Canada, Herzberg Institute of Astrophysics, Victoria, BC.

Total is the sum of the daily bright sunshine values in hours and tenths of hours as measured by an automated sunshine recorder using voltaic cells.

DEGREE-DAY is an index for various temperature related calculations

Cooling (CDD) is the cooling requirement to achieve a stipulated comfort value in an indoor environment. For most purposes, a temperature of greater than 18°C is considered uncomfortable and supplementary cooling is required. On a specific day, the amount by which 18°C is less than the daily average temperature defines the number of cooling degree-days for that day.

Mathematically:

CDD = (T - 18°C), for that day, where T = daily mean temperature in °C if T is equal to or less than 18°C, CDD = 0.

Monthly and annual values of CDD are obtained by summing daily values.

Extreme Cooling (XCDD) A temperature of greater than 24°C has been used as an index of potential heat stress. On a specific day, the amount by which 24°C is less than the daily average temperature defines the number of extreme cooling degree-days for that day.

Mathematically:

XCDD = (T - 24°C), for that day, where T = daily mean temperature in °C if T is equal to or less than 24°C, XCDD = 0.

Monthly and annual values of XCDD are obtained by summing daily values.

Growing (GDD) is the growing requirement in order for plant growth to proceed. The air temperature must exceed a critical value appropriate to the plant species in question. For many members of the grass family, including most commercial cereals grown on the prairies, a base temperature of 5.0°C has been established. On a specified day, the difference between the daily average temperature and the 5.0°C base temperature defines the number of growing degree-days.

Mathematically:

GDD = (T - 5.0°C), for that day, where T = daily mean temperature in °C if T is equal to or less than 5.0°C, GDD = 0.

Daily GDD values are summed to provide totals for the appropriate month, growing season or year.

Heating (HDD) is the heating requirement to achieve a stipulated comfort value in an indoor environment. For most purposes, a temperature of less than 18°C is considered uncomfortable and supplementary heating is required. On a specific day, the amount by which 18°C exceeds the daily average temperature defines the number of heating degree-days for that day.

Mathematically:

HDD = (18°C - T), for that day, where T = daily mean temperature in °C if T is equal to or greater than 18°C, HDD = 0.

Monthly and annual values of HDD are obtained by summing daily values.

EXTREME is the highest or lowest value of a particular element recorded during the period in question.

EXTREME ALL YEARS Temporal comparisons at a point are also of value in some types of climatic studies. Therefore, it is desirable to produce the maximum length of reliable climatic record to carry out studies over a period of time. Data are drawn from the following data sets:

Saskatoon, SRC:1963 to present
Saskatoon, University of Saskatchewan:1916 to 1963
Saskatoon, City:1892 to present

Station locations, exposures and measurement procedures were subject to change during this time period. Data are not adjusted and users are cautioned accordingly.

FROST is recorded on each occasion when the daily minimum temperature is equal to or less than 0°C.

NORMAL VALUE (1961-1990) In climatology it is often useful to make spatial comparisons of particular element values over a common time period. At an interior continental site such as Saskatoon, a period of 30 years is required to produce statistically stable estimates of the more variable elements. To facilitate spatial comparisons, the World Meteorological Organization recommends the standard normal (average) period of thirty years. The current normal period for data analysis is from January 1st, 1961 to December 31st, 1990. Data derived from CRS conform to this standard, except where noted. The normals for CRS are taken from the normals published by Environment Canada for the standard period. Normals used in SRC CRS annual summaries 1990 - 1996 were hand-calculated values determined before the official normals were published.

NUMBER OF RECORDING YEARS Due to missing observations, faulty instrument calibration, lost records, *etc.*, only partial data sets are available especially during the period 1892 - 1915. The number of years of useful record is therefore cited.

PRECIPITATION

Day is recorded on occasions when the amount of precipitation in a 24-hour period equals or exceeds 0.2 mm water. An asterisk (*) appearing in the average column denotes the occurrence of measurable precipitation on one or more occasions, and that the calculated 30-year average amounts to less than a trace. The so-called climatological day, beginning at 9 a.m. standard time on the date of reference and ending at 9 a.m. the next morning, was employed in record keeping up to January 1994. On February 1, 1994, after consultation with Environment Canada, record keeping was changed to the 24-hour period of 0000 hours - 2400 hours to conform to their reporting of climatological statistics.

Total is the sum of the daily recorded precipitation. The snowfall component of precipitation is recorded as an equivalent amount of liquid water. For particulars on precipitation measurement procedures and instruments, the reader is referred to the Environment Canada publication "*Manual of Climatological Observation's*", 2nd Ed., January, 1978. The notation "T" refers to a trace of precipitation (less than 0.2 mm water equivalent). As of August 7, 1993, total precipitation was measured using the Belfort weighing gauge for the winter season and the tipping bucket during frost-free period.

SOIL TEMPERATURE under a short grass surface with normal snow accumulation, is measured according to procedures outlined in the Environment Canada publication "*Soil Temperature*" January 1, 1976. Depths below surface at which soil temperature measurements are made are: 5 cm, 10 cm, 20 cm, 50 cm, 100 cm, 150 cm and 300 cm. Since soil temperature is affected by profile structure and water content, extrapolation of the measured data is difficult.

SOLAR RADIATION

Diffuse - Total is radiation reaching the earth's surface after having been scattered from the direct solar beam. The instrument used is an Eppley pyranometer with a shade ring (See SOLAR RADIATION-Global- Total).

Global - Total is the sum of the direct solar and diffuse radiation during the period in question. Measurements are carried out on a horizontal surface near ground level and integrated over the whole celestial dome, summing the diffuse and direct components of the solar beam. The temperature-compensated Eppley pyranometer is used. The standard metric unit of measurement is the megajoule per square meter (MJ/m^2). (To facilitate comparison with past years' data: 1.0 MJ/m^2 = 23.895 langleys). Comparison is provided with a provisional average based on 16 years of data (1975-1990).

SPELLS - Temperature spells are defined as a sequence of days when the daily maximum temperature is higher than or equal to 30°C (hot spell) or the daily minimum temperature is lower than or equal to -30°C (cold spell).

SUNRISE/SUNSET times have been included in this report. They have been acquired from the National Research Council, Canada, Herzberg Institute of Astrophysics.

TEMPERATURE

Average Annual is the average of the daily average temperatures in degrees Celsius (°C) for one year.

Average Daily is defined as the arithmetic mean of the daily maximum temperature in degrees Celsius (°C) and the daily minimum temperature in degrees Celsius (°C) for the day in question.

Average Maximum is the average of the daily maximum temperatures in degrees Celsius (°C) average over the appropriate time periods. For details concerning measurement procedures, the reader is referred to the Environment Canada publication, "*Manual of Climatological Observations*", 2nd Ed., January, 1978.

Average Minimum is the average of the daily minimum temperatures in degrees Celsius (°C) averaged over the appropriate time periods. Refer to TEMPERATURE-Average Maximum concerning measurement procedures.

Average Monthly is the average of the daily average temperatures in degrees Celsius (°C) for the month under consideration.

WIND CHILL describes a sensation, the way we feel as a result of the combined cooling effect of temperature and wind. This feeling can't be measured using an instrument, so a mathematical formula was developed in 1939 that related air temperature and wind speed to the cooling sensation. This formula was revised in 2001 by a team of scientists and medical experts from Canada and the U.S. with the Canadian Department of National Defence contributing human volunteers. The new index is based on the loss of heat from the face (Environment Canada 2001a).

WIND SPEED

Average is the average of the hourly wind speeds for the period in question measured in kilometres per hour (km/h). Average hourly wind speeds are obtained from a RM Young Wind Monitor anemometer at a height of 10 m.

Peak Gust refers to the highest instantaneous value recorded by the anemometer system for the period of reference, irrespective of direction and/or duration. Comparison is with published data for Environment Canada, Saskatoon Airport station.

see also **Beaufort Wind Scale**

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